

Lake Mead National Recreation Area

National Park Service
U.S. Department of the Interior

Lake Mead National Recreation Area
Nevada



Environmental Assessment Improvement to Wastewater Treatment Facility October 2003



ENVIRONMENTAL ASSESSMENT

Improvements to the Wastewater Treatment Facility

Prepared For:
National Park Service

Prepared By:
engineering-environmental Management, Inc.

Lake Mead National Recreation Area
Nevada

**U.S. Department of the Interior
National Park Service**

**Environmental Assessment
Improvements to the Wastewater Treatment Facility
Willow Beach, Lake Mead National Recreation Area
Arizona**

Summary

At Lake Mead National Recreation Area, the National Park Service proposes to replace the deteriorating wastewater collection and treatment system at Willow Beach with a new system that treats sewage via septic tanks, a recirculating sand filter, and subsurface disposal. The project is needed because the aging wastewater system currently in place at Willow Beach is out of compliance with applicable State of Arizona Department of Environmental Quality regulations and there is a potential for ground and surface water contamination from the system, as well as adverse health effects.

This environmental assessment examines in detail three alternatives: no action (alternative A), the National Park Service preferred alternative (alternative B), and an alternative that would use new evaporative sewage lagoons to treat effluent at Willow Beach (alternative C). The preferred alternative would have no or negligible impacts on Indian trust resources, wetlands, prime and unique farmlands, ecologically critical areas, Wild and Scenic Rivers, other unique natural areas, archeological resources, cultural landscapes, historic structures, ethnographic resources, museum objects, park operations, soundscapes, lightscapes, environmental justice, or socioeconomics.

Short- and long-term, negligible to moderate, adverse impacts would occur to biotic communities from construction activities. However, replacement of the deteriorating wastewater collection and treatment system would also have short- and long-term, beneficial effects on biotic communities. There would be no impacts to threatened or endangered species. The construction of flood protection berms would have a long-term, minor, adverse effect on floodplains. A long-term, beneficial effect on water quality would be anticipated from replacement of the deteriorating wastewater collection and treatment system. Short-term, negligible to moderate, adverse impacts to water quality could result from increased erosion, sedimentation, and turbidity. The use of construction equipment in the Willow Beach area would have short-term, negligible, and adverse impacts to water quality. Impacts to soils from construction activities would be long term, negligible to minor, and adverse. Impacts to air quality from dust and construction equipment would be short term, negligible to minor, and adverse.

A determination of no adverse effect to archeological resources and historic structures has been made under section 106 of the National Historic Preservation Act. Construction in Willow Beach would have short- and long-term, adverse impacts on ethnographic resources of significance to American Indian tribes. However, specific mitigation would offset the adverse effects to the greatest degree possible. Minor, short-term, adverse impacts on visitor use and experience from construction activities would be anticipated. Short- and long-term, beneficial effects to health and safety are anticipated from the replacement of the deteriorating wastewater collection and treatment system at Willow Beach.

Notes to Reviewers and Respondents

This environmental assessment is available on the Lake Mead National Recreation Area Internet Web site. It is being distributed for public and agency review and comment for a period of 30 days.

If you wish to comment on the environmental assessment, you may mail comments to the name and address below. Our practice is to make comments, including names and home addresses of respondents, available for public review during regular business hours. Individual respondents may request that we withhold their home address from the record, which we will honor to the extent allowable by law. *If you want us to withhold your name and address, you must state this prominently at the beginning of your comment.* We will make all submissions from organizations and businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, available for public inspection in their entirety.

Please address comments to: William A. Dickinson, Superintendent; Lake Mead National Recreation Area; Attn: Willow Beach Wastewater Treatment Facility; 601 Nevada Way; Boulder City, NV 89005

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ACRONYMS AND ABBREVIATIONS

ADEQ	State of Arizona Department of Environmental Quality
CFR	Code of Federal Regulations
fps	feet per second
NEPA	National Environmental Policy Act of 1969, as amended
NRA	National Recreation Area
NRHP	National Register of Historic Places
SHPO	State Historic Preservation Office
USC	United States Code

PROPOSED ACTION

INTRODUCTION

Purpose Of and Need For Action

The National Park Service is considering the replacement of the deteriorating wastewater collection and treatment system at Willow Beach within Lake Mead National Recreation Area (NRA), Arizona (figure 1). The preferred alternative would be a replacement that treats sewage via septic tanks, a recirculating sand filter, and subsurface disposal. The wastewater treatment and disposal facility serves the Willow Beach developed area. Facilities in Willow Beach include seven launching lanes for boats, 155 pull-through parking spaces, 10 housing units, 15 picnic sites, a marina with fuel service and boat rentals, a store, and a fish cleaning station. The project is needed because the aging wastewater system currently in place at Willow Beach is out of compliance with applicable State of Arizona Department of Environmental Quality (ADEQ) regulations. The ADEQ observed that substantial potential exists for ground and surface water pollution as well as adverse public health effects, and has issued a Notice of Violation to the recreation area.

An environmental assessment analyzes the proposed action and alternatives and their potential impacts on the environment. This environmental assessment has been prepared in accordance with the National Environmental Policy Act of 1969, as amended (NEPA), its implementing regulations published by the Council on Environmental Quality (40 *Code of Federal Regulations* (CFR) 1500-1508), and the National Park Service Director's Order – 12: *Conservation Planning, Environmental Impacts Analysis, and Decision-making*.

RECREATION AREA PURPOSE, SIGNIFICANCE, AND MISSION

An essential part of the planning process is understanding the purpose, significance, and mission of the recreation area for which this environmental assessment is being prepared. A description for each of these legislative mandates is presented herein.

Recreation Area Purpose

The purpose of Lake Mead NRA is to:

Provide public recreation, benefit, and use in a manner that will preserve, develop, and enhance, so far as practicable, the recreation potential, and preserve the scenic, historic, scientific, and significant features of the area (NPS 2000).

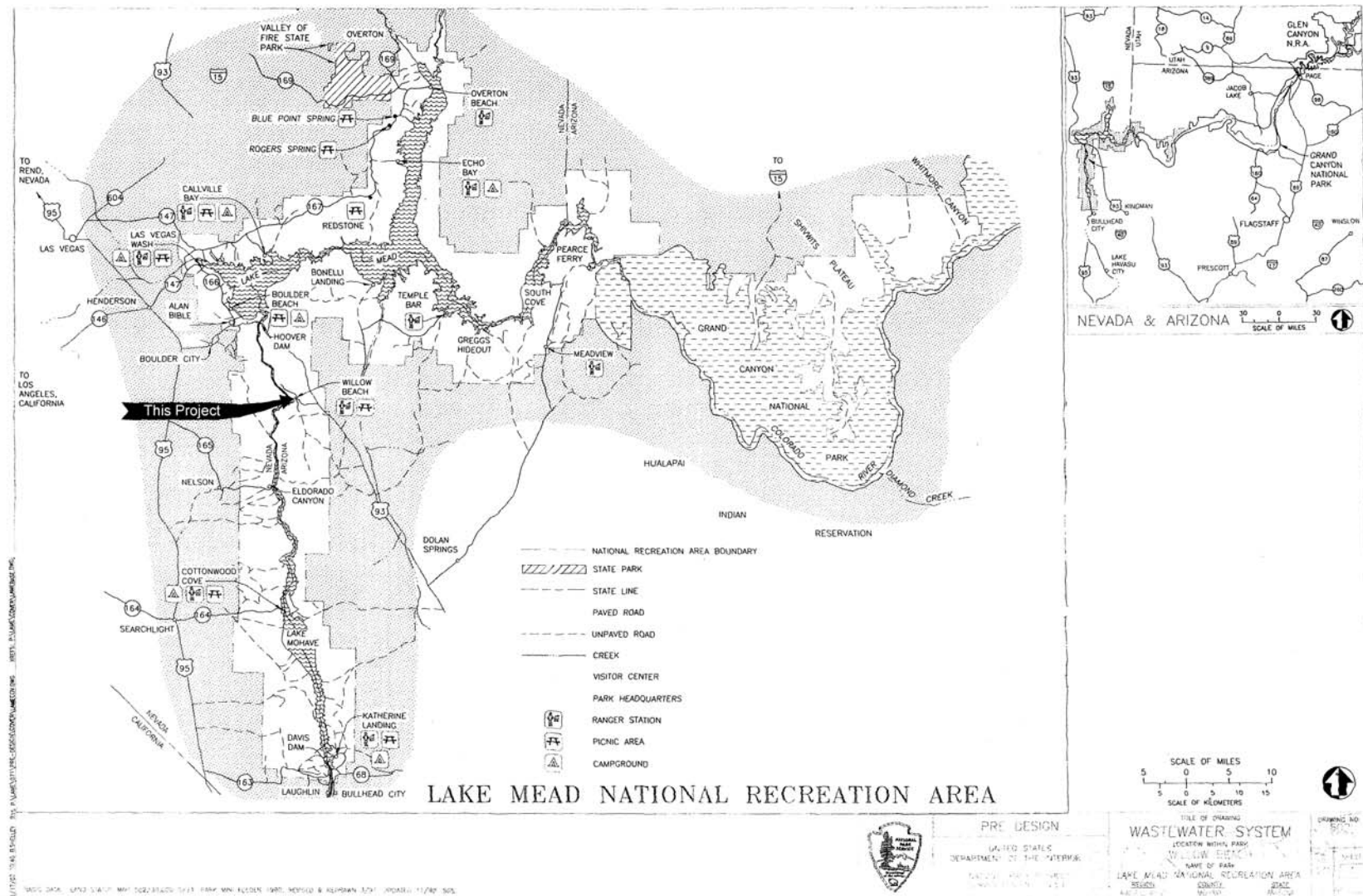


FIGURE 1. LOCATION MAP OF LAKE MEAD NATIONAL RECREATION AREA AND WILLOW BEACH

Recreation Area Statement of Significance

The significance of Lake Mead NRA:

Lake Mead NRA is the premiere inland water recreation area in the West with 1.5 million surface acres, including 700 miles of shoreline on Lakes Mead and Mohave. It represents superlative examples of the plants, animals, and physical geography of the Mojave Desert, Colorado Plateau, and Basin and Range geologic provinces. The park includes many regionally and nationally significant natural resource components, including populations of federally listed threatened and endangered species of animals, birds, fish, and plants. The area also represents a continuum of cultural resources from prehistoric to historic sites, including several culturally sensitive areas with sacred and traditional significance to contemporary American Indians.

Lake Mead NRA provides a wide variety of unique outdoor recreation opportunities ranging from warm-water recreation to exploration of rugged and isolated backcountry, making it a wilderness park in an urbanizing setting. The area generates over \$500 million directly for the local economy. Lake Mead NRA serves as a major focus in the western United States for public outdoor water recreation, which is at a premium in this desert environment. The area is within a day's drive of 20 million people in the Los Angeles Basin and 2.7 million people in the Phoenix metropolitan area. Lake Mead is also within a 20-minute drive of 1.1 million people in the Las Vegas Valley, with up to 6,000 new residents per month and 30 million visitors per year, making Las Vegas one of the fastest-growing communities and tourism destinations in the country (NPS 2000).

Recreation Area Mission

The mission of Lake Mead NRA is to:

Provide diverse inland water recreational opportunities in a spectacular desert setting for present and future generations (NPS 2000).

PROJECT BACKGROUND, PREVIOUS PLANNING, SCOPING, AND VALUE ANALYSIS

Project Background

The Willow Beach wastewater collection and treatment system has been in operation for more than 25 years. Major system components have deteriorated over time, including the lift station pumps, motors, wet wells, check valves and force mains, sewerlines, manholes, the sewage lagoon pond linings (figure 2), pond aerators, and all electrical controls. In addition, the system has many shortcomings, including inadequate odor control, venting, remote alarm systems, emergency overflow for lift station wet wells, protection from a 100-year flood event, and proper drop lines into manholes.



FIGURE 2. DETERIORATING SEWAGE LAGOON LINING AT THE EXISTING WASTEWATER TREATMENT FACILITY

The ADEQ has previously issued a series of warnings and demands (e.g., letters and notices of violations) to Lake Mead NRA to address and correct the existing problems with the Willow Beach wastewater collection and treatment system. The warnings culminated in a Notice of Violation dated May 27, 1999, and a draft Consent Order issued June 2, 2002. Some of the concerns expressed by the state included:

- Lift station located in a floodplain.
- Inadequate solids screening.
- Unreliable flow measurement.
- Vegetation in ponds is not removed.
- Damage/erosion to the flood protection berm.
- Damage to the membrane liner in the ponds.
- Unreliable aerators.
- Odors from the collection and treatment system.
- Build-up of solids.
- Fish cleaning solids are not separated.
- Solids in wet wells are obstructing suction pipes.

- Deterioration of the wet well sidewalls.
- Corrosion from saturation of soils adjacent to wet wells.
- Inadequate protection of wastewater system infrastructure.

Nearly concurrent with the draft Consent Order issue, the National Park Service accelerated the construction package necessary to bring the wastewater treatment system into compliance from fiscal year 2007 to fiscal year 2004. Subsequently, the park and ADEQ agreed that the state would not conduct an enforcement action with the conditions that the project construction schedule for 2004 would remain on track, and the park would implement additional operation and maintenance measures during the intervening time period.

PREVIOUS PLANNING

In 1974, a major flash flood of Eldorado Canyon, a developed area located approximately 12 miles downstream from Willow Beach, resulted in loss of life and extensive property damage. Subsequent to the flood, the National Park Service re-examined the flash flood potential at all developed areas in Lake Mead NRA. In 1979, as a result of those studies, the National Park Service closed several facilities at Willow Beach that were deemed high-risk. A series of planning efforts ensued and culminated in the issuance of a Development Concept Plan Amendment to the Final Environmental Impact Statement for the Lake Mead NRA *General Management Plan*. The regional director approved the *Development Concept Plan* on December 16, 1994.

The *Willow Beach Development Concept Plan* (NPS 1994) examined alternatives for resolving flash flood risks and identified certain areas suitable for development. Under the preferred alternative of the *Development Concept Plan*, the current location of the wastewater lagoons was identified for use as a combined National Park Service / concession maintenance facility and native plant nursery. An area west of the Willow Beach Wash lagoon site was identified for use as a campground and National Park Service concession housing area (figure 3). Therefore, the wastewater collection and treatment system improvements considered in this environmental assessment were designed to accommodate and not conflict with the development identified in the *Development Concept Plan*.

In May 1996, the National Park Service submitted a project request to construct new evaporative lagoons approximately 0.5 mile up Willow Beach Wash from the current location. Although consistent with the *Willow Beach Development Concept Plan*, this site lies within a narrow portion of the wash that is divided by a large ridge remnant and would require extensive structural flood mitigation to protect it from flash flooding. To develop alternatives to the lagoon approach, the National Park Service conducted a value analysis workshop as part of the internal scoping process.

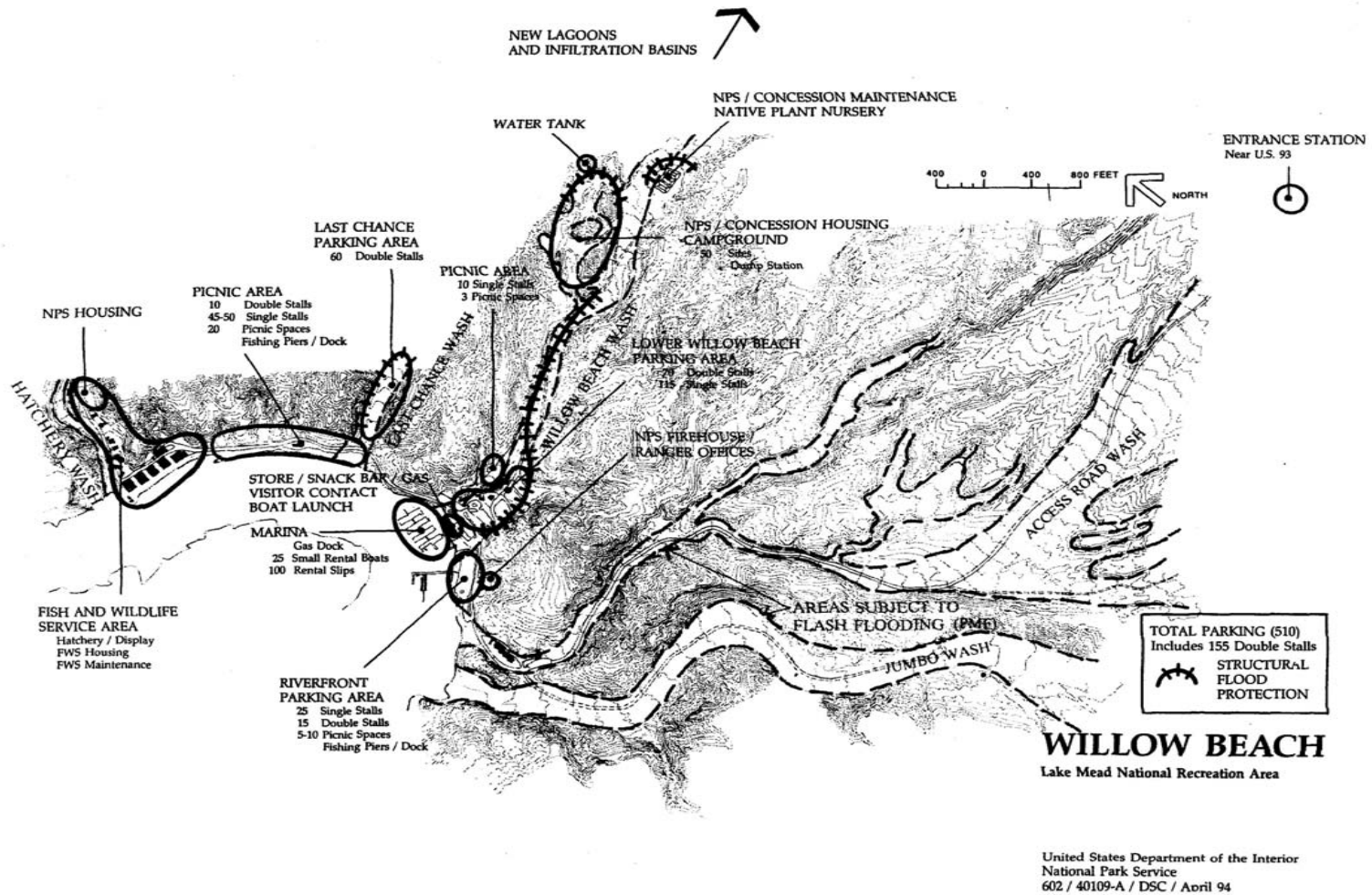


FIGURE 3. PROPOSED DEVELOPMENT FROM THE WILLOW BEACH DEVELOPMENT CONCEPT PLAN

SCOPING AND VALUE ANALYSIS

Generally, scoping represents the effort to involve agencies and citizens in determining issues to be addressed in the environmental assessment. Scoping was used to determine important issues to be given detailed analysis in the environmental assessment and eliminate issues not requiring detailed analysis; to allocate assignments among the interdisciplinary team members and/or other participating agencies; identify related projects and associated documents; identify permits, surveys, consultations, etc. required by other agencies; and to create a schedule that allows adequate time to prepare and distribute the environmental assessment for public review and comment before a final decision is made. Scoping includes any interested agency, or any agency with jurisdiction by law or expertise (including the State Historic Preservation Office (SHPO) and American Indian tribes) to obtain early input.

As part of the internal scoping process, a Value Analysis Study was conducted on May 28 and 29, 2002, at Lake Mead NRA. The objectives of this study were to identify and evaluate wastewater treatment and disposal system alternatives that would:

- meet all current and anticipated Arizona wastewater regulations
- meet the needs of the development within the Willow Beach area as described in the *Development Concept Plan*

During the Value Analysis Study, the National Park Service developed three alternatives to the original proposal (constructing new sewage lagoons farther up Willow Beach Wash) that meet state regulatory requirements and were compatible with the development proposed in the *Development Concept Plan*. The new alternatives included:

1. a wastewater treatment system consisting of septic tanks, a recirculating sand filter, and subsurface effluent disposal
2. a wastewater treatment system consisting of septic tanks and a leachfield
3. a wastewater treatment system consisting of septic tanks, a constructed wetland, and subsurface effluent disposal

Construction and life-cycle cost estimates were developed, and the four alternatives were evaluated using a process called Choosing By Advantages. In the Choosing By Advantages methodology, evaluation factors were selected and attributes or characteristics of each alternative were identified relative to the evaluation criteria. A determination of the advantages for each alternative is made with each evaluation factor and then weighted in importance. The alternatives were then compared using a combination of cost and importance values, reviewing the differences in advantages and some of the underlying attributes (e.g., level of disturbance, energy requirements, potential for failure of the proposed systems). The recirculating sand filter with subsurface disposal system was chosen as the preferred alternative because it represented the best value when compared to the other proposals. Although the other proposals had higher importance values, the gain in importance was not deemed worth the increased costs when compared to the preferred alternative.

A press release initiating scoping and describing the proposed action was issued on November 7, 2002 (appendix A). Comments were solicited during a public scoping period that ended December 7, 2002. No comments were received. Citizen and American Indian groups traditionally associated with the lands of Lake Mead NRA will also have an opportunity to review and comment on this environmental assessment.

The National Historic Preservation Act, as amended, (16 *United States Code* (USC) 470 *et seq.*), NEPA, National Park Service Organic Act, *NPS Management Policies* (2001), Director's Order – 12: *Conservation Planning, Environmental Impact Analysis, and Decision-making* (2001a), and Director's Order – 28: *Cultural Resources Management Guideline* (1997) require the consideration of impacts on cultural resources, either listed in or eligible to be listed in, the National Register of Historic Places (NRHP). The project area has been surveyed for archeological resources and historic structures (Ervin 1986, Guisto 2002). No archeological resources or historic structures are located within the area of potential effect for this project. By stamp dated July 3, 2003, the Arizona SHPO concurred with these findings (appendix C). These actions fulfill Lake Mead NRA obligations under section 106 of the National Historic Preservation Act, as outlined in the 1995 Programmatic Agreement among the National Park Service, Advisory Council on Historic Preservation, and the National Council of Historic Preservation Officers.

ISSUES AND IMPACT TOPICS

Issues

Issues and concerns affecting this proposed action were identified from past National Park Service planning efforts, and input from individuals, environmental groups, and state and federal agencies. The major issues are the conformance of the proposed action with the *Willow Beach Development Concept Plan* (1994) and *General Management Plan* (1986) and potential impacts to biotic communities, threatened and endangered species and other species of concern, floodplains and water quality, soils, air quality, ethnographic resources, visitor use and experience, and health and safety.

Derivation of Impact Topics

Specific impact topics were identified for focused discussion and to allow comparison of the environmental consequences of each alternative. Impact topics were identified based on federal law, regulations, and Executive Orders; 2001 *NPS Management Policies*; and National Park Service knowledge of sensitive or potentially impacted resources. A brief rationale for the selection of each impact topic is given below, as well as a rationale for dismissing specific topics from further consideration.

Impact Topics Selected for Detailed Analysis

Biotic Communities

NEPA requires an examination of the impacts on all components of affected ecosystems and is the charter for the protection of the environment. NEPA also requires federal agencies to use all practicable means to restore and enhance the quality of the human environment and to avoid and minimize any possible adverse effects of their actions upon the environment. National Park Service policy is to protect the components and processes of naturally occurring biotic communities, including the natural abundance, diversity, and ecological integrity of plants and animals (*NPS Management Policies* 2001). The proposed action has the potential to affect biotic communities, including the potential to introduce Sahara mustard (*Brassica tournefortii*) in the project site; therefore, this impact topic is addressed in detail in the environmental assessment.

Threatened and Endangered Species and Species of Special Concern

The Endangered Species Act of 1973, as amended, requires an examination of impacts on all federally listed threatened or endangered species, as well as designated critical habitat. National Park Service policy also requires examination of the impacts on federal candidate species, as well as state-listed threatened, endangered, candidate, rare, declining, and sensitive species. Lake Mohave is designated critical habitat for the razorback sucker (*Xyrauchen texanus*) and bonytail chub (*Gila elegans*), both listed as endangered under the Endangered Species Act of 1973, as amended, that could be affected; therefore, this impact topic is addressed in the environmental assessment.

Floodplains and Water Quality

Executive Order 11988 (*Floodplain Management*) requires an examination of impacts to floodplains and potential risk involved in placing facilities within floodplains. *NPS Management Policies*, Director's Order – 2: *Planning Guidelines*, and Director's Order – 12: *Conservation Planning, Environmental Impact Analysis, and Decision-making* provide guidelines for proposed actions in floodplains. The 1972 Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977, is a national policy to restore and maintain the chemical, physical, and biological integrity of the nation's waters, to enhance the quality of water resources, and to prevent, control, and abate water pollution. *NPS Management Policies* provide direction for the preservation, use, and quality of water in national park units. Floodplains and water quality could be affected by the proposed action; therefore, this impact topic is addressed in the environmental assessment.

Soils

Since the proposed action involves ground-disturbing activities on previously undisturbed desert wash soil, soils are addressed as an impact topic in the environmental assessment.

Air Quality

The 1963 Clean Air Act, as amended (42 USC 7401 *et seq.*), requires land managers to protect air quality. Section 118 of the Clean Air Act requires parks to meet all federal, state, and local air pollution standards. *NPS Management Policies* address the need to analyze potential impacts to air quality during park planning. Lake Mead NRA is classified as a Class II air quality area under the Clean Air Act, as amended. The proposed action has the potential to affect air quality; therefore, this impact topic is addressed in the environmental assessment.

Ethnographic Resources

The National Park Service defines ethnographic resources as any:

“site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it” (Director’s Order – 28: *Cultural Resource Management Guideline*, p.191).

Because ethnographic resources are known to exist at or in proximity to the project area, ethnographic resources are addressed as an impact topic in the environmental assessment.

Visitor Use and Experience

Short-term effects to visitor use and experience would be expected during project construction in the form of traffic delays and reduced circulation in parking areas. Since construction activities could affect visitor use and experience at Willow Beach this topic is addressed in the environmental assessment.

Health and Safety

Public safety and worker safety could potentially be affected by selection of either alternative; thus, health and safety is addressed as an impact topic in this environmental assessment.

Impact Topics Dismissed from Detailed Analysis

Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by Department of Interior agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes.

There are no Indian trust resources in Lake Mead NRA. The lands comprising Lake Mead NRA are not held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Therefore, Indian trust resources was dismissed as an impact topic.

Wetlands

Executive Order 11990 (*Protection of Wetlands*) requires an examination of impacts to wetlands. There are no jurisdictional or National Park Service-defined wetlands within the project area. Therefore, wetlands were dismissed as an impact topic.

Prime and Unique Farmlands

In 1980, the Council on Environmental Quality directed that federal agencies assess the effects of their actions on farmland soils classified by the United States Department of Agriculture's Natural Resources Conservation Service as prime or unique. Prime or unique farmland is defined as soil, which particularly produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. There are no prime or unique farmlands associated with the project area, so this topic was dismissed from detailed analysis.

Ecologically Critical Areas, Wild and Scenic Rivers, Other Unique Natural Areas

No areas within Lake Mead NRA have been designated as ecologically critical, nor are there any existing or potential Wild and Scenic Rivers within Lake Mead NRA. Lake Mead is an important natural area, but the proposed action would not threaten the qualities and resources that make Lake Mead NRA special. Critical habitat, designated under the Endangered Species Act of 1973, as amended, is considered with the threatened and endangered species and species of concern. This topic was, therefore, dismissed from detailed analysis.

Archeological Resources

Lake Mead NRA cultural resource staff conducted a survey of the project area and identified no archeological resources in the area of potential effect for this project (Ervin 1986, Guisto 2002). Therefore, archeological resources was dismissed as an impact topic.

Cultural Landscapes

As described by the National Park Service Cultural Resource Management Guideline (Director's Order – 28), a cultural landscape is: "...a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined both by physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions." No cultural landscapes have been identified in the Willow Beach area (Ervin 1986, Guisto 2002); therefore, cultural landscapes was dismissed as an impact topic.

Historic Structures

No buildings or structures in the project area are listed (or have been determined eligible for listing) in the NRHP. Buildings in the Willow Beach developed area date to the Mission 66 era. Mission 66 was a major program for national park improvements from the 1950s through 1966.

No Willow Beach structures would be affected by the wastewater improvement alternatives (Ervin 1986, Guisto 2002); therefore, historic structures was dismissed as an impact topic.

Museum Objects

Museum collections include historic artifacts, natural specimens, and archival and manuscript material. They may be threatened by fire, vandalism, natural disasters, and careless acts. The preservation of museum collections is an ongoing process of preventative conservation, supplemented by conservation treatment when necessary. The primary goal is preservation of artifacts in as stable condition as possible to prevent damage and minimize deterioration. The proposed activities at Willow Beach would not affect museum objects of Lake Mead NRA; therefore, museum objects was dismissed as an impact topic.

Park Operations

Although there would be some differences in staff time, equipment, and maintenance activities required among the different wastewater treatment alternatives, impacts on Lake Mead NRA operations would be negligible overall. Therefore, park operations were not addressed as an impact topic.

Soundscapes

In accordance with *NPS Management Policies* (2001) and Director's Order – 47: *Sound Preservation and Noise Management*, an important part of the National Park Service mission is preservation of natural soundscapes associated with national park units. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in park units, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials. The frequencies, magnitudes, and durations of human-caused sound considered acceptable varies among National Park Service units, as well as potentially throughout each park unit, being generally greater in developed areas and less in undeveloped areas. Noise associated with wastewater treatment system improvements would be short term and localized, and activities would be scheduled so as to minimize effects on visitor experiences. The improvements would not result in a measurable increase in traffic and associated noise. Overall, effects would be negligible; therefore, soundscapes was dismissed from detailed analysis.

Lightscaapes

In accordance with *NPS Management Policies* (2001), the National Park Service strives to preserve natural ambient landscapes, which are natural resources, and values that exist in the absence of human-caused light. Lightscaapes would not be affected by the proposed action; therefore, lightscaapes was dismissed from detailed analysis.

Environmental Justice

Executive Order 12898 (*General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*) requires all agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations or communities. No alternative would have health or environmental effects on minorities or low-income populations or communities as defined in the Environmental Protection Agency's Draft Environmental Justice Guidance (July 1996). Environmental justice was dismissed from detailed analysis.

Socioeconomics

No alternative would change local or regional land use or transportation, nor would it appreciably affect local businesses outside Lake Mead NRA and/or other agencies. The action alternatives could provide a beneficial impact to the economies of Boulder City, Henderson, or Las Vegas (e.g., minimal increases in employment opportunities for the construction work force and revenues for local businesses and government from construction activities and workers). Construction activities for the preferred alternative are projected to take 12 to 18 months. Any benefit to the economy would be temporary (lasting only during construction) and negligible overall; therefore, the socioeconomic environment was dismissed from detailed analysis.

PROPOSED ACTION

ALTERNATIVES

ALTERNATIVE A: NO ACTION

Alternative A provides a baseline for evaluating the changes and effects related to alternatives B and C. Under this alternative, the National Park Service would continue to use the deteriorating sewage collection and treatment system at Willow Beach. The system consists of collection and transmission lines, manholes, lift stations, sewage lagoons (figure 4), and an effluent surface discharge (sprayer) system that is no longer used in response to state law (figure 5). Raw sewage is currently collected from various points and pumped to the sewage lagoons located approximately 3,500 feet up Willow Beach Wash from the developed area. The sewage collection and transmission lines, manholes, lift stations, and lagoon liners are deteriorating. Leakage is associated with the deteriorating conditions. Under current management, Lake Mead NRA staff make repairs to the current system and respond to these situations, as necessary. Under this alternative, Lake Mead NRA would need to respond to the Notice of Violation and Draft Consent Order and bring the facility into compliance with state standards. The no-action alternative would use approximately 53,000 kilowatt hours per year of electrical power if the lagoons operated at design capacity. However, since the lagoons are not operated at design capacity, actual energy usage is somewhat less.



FIGURE 4. UPPER SEWAGE LAGOON IN WILLOW BEACH WASH



FIGURE 5. SPRAYERS FOR NON-OPERATIONAL SURFACE EFFLUENT DISCHARGE SYSTEM

ALTERNATIVE B: PREFERRED ALTERNATIVE

Alternative B is the National Park Service preferred alternative. Under alternative B, the aging sewage disposal and treatment system would be replaced with a new system that treats sewage via septic tanks, a recirculating sand filter, and subsurface disposal. Alternative B would also include installation of new force mains, replacement of deteriorated collection system components, construction of a new access road to the wastewater treatment area, and other miscellaneous mechanical, civil, electrical, and site work in support of the system. See figure 6 and figure 7 for site plan illustrations.

Six individually sized septic tanks would be installed under alternative B and would provide primary sewage treatment (separation and biological reduction of solids) at Willow Beach developed facilities (dock dump station, fish cleaning station, restrooms, store, etc.). Effluent from the six septic tanks would then be pumped 235 feet through 6-inch sanitary sewerlines to a central collection point, using duplex lift stations associated with each tank. From the collection point, a main lift station would pump the effluent along a new 4-inch force main

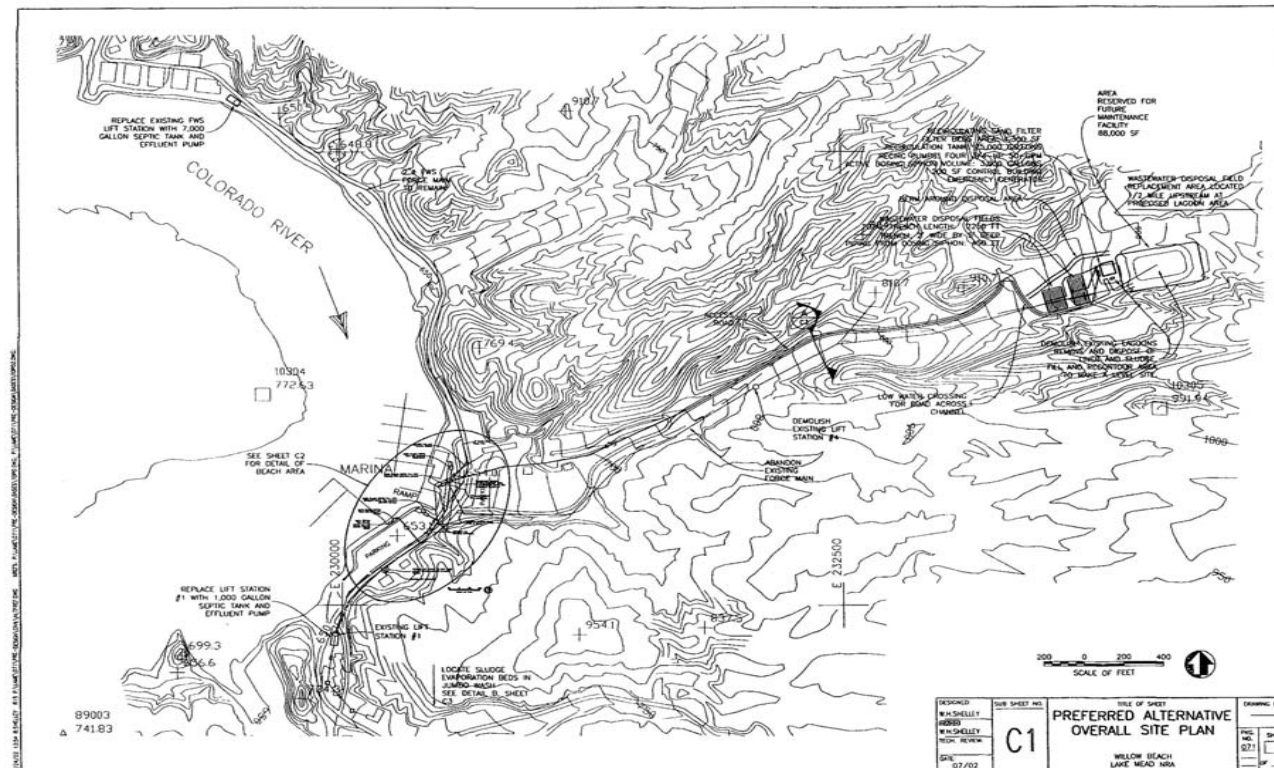


FIGURE 6. OVERALL SITE PLAN FOR THE PREFERRED ALTERNATIVE AT WILLOW BEACH

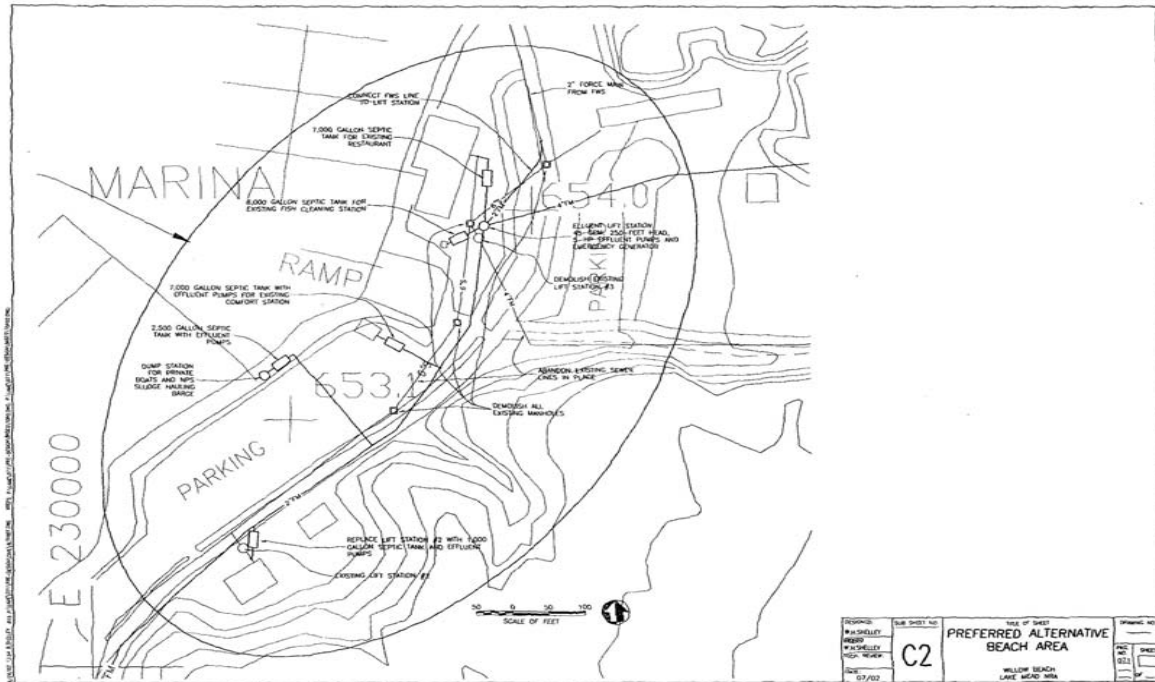


FIGURE 7. BEACH AREA DETAILS FOR THE PREFERRED ALTERNATIVE AT WILLOW BEACH

pipeline to the wastewater treatment area, located about 3,000 feet up Willow Beach Wash, adjacent to the downhill end of the existing sewage lagoon area. The force main would be buried beneath the new access road that would be constructed to the effluent treatment area.

The new access road would be located primarily on the north side of Willow Beach Wash and would be designed to remain accessible during a 25-year flood event, as well as to withstand a 100-year flood event, including protection of the pipeline under these storm conditions. This would require raising the road surface and protecting it with riprap. It is estimated that the road would be approximately 5 feet higher than the surrounding wash. Portions of the existing access road would be modified to meet these criteria in areas where the existing road is located along the new road route. To construct the road, alluvial material from Willow Beach Wash would be pushed from the wash bottom, along the entire road length, to the north side, resulting in only a few inches of lost material overall. It is estimated that approximately 100,000- to 150,000-cubic feet of material would be moved. Also, approximately 1,300 feet downstream of the proposed treatment area, undercutting of the north bank of the wash has occurred creating an overhanging slope. The slopes here, and in other such areas, would be cut back to eliminate the overhang, allow for the appropriate placement of the road, and reestablish a natural grade on the banks and in the channel. All material for construction and reinforcement of the road is anticipated to come from the wash and removal of the overhang (i.e., no outside material should be required). A small ditch would be created on the north side of the new access road to carry runoff from the adjacent hill and protect the road. Upon completion of the road, the wash would be recontoured to minimize the impact of the excavation.

At the wastewater treatment area, the effluent would enter a buried holding tank adjacent to a recirculating sand filter bed contained in a below-grade structure. Effluent from the holding tank would be pumped into and continuously circulated through the sand filter, which produces a high-quality, treated effluent. A portion of the sand-filter treated effluent would be diverted into subsurface trenches for final treatment by soil filtration.

Existing sewerlines at the developed area would be abandoned in place and existing manholes would be removed. The two existing sewage lagoons would be demolished; the remaining sludge and liners would be removed and disposed of appropriately. The lagoons would then be filled and the area re-contoured to level a site for construction of a future maintenance area (see the *Willow Beach Development Concept Plan* 1994, and figure 3 of this environmental assessment).

Solids would be removed from septic tanks every three to five years and hauled by truck as raw, wet solids to an approved disposal facility about 90 miles away. Alternatively, the raw solids could be hauled to a flood-protected site near Willow Beach for drying. The dried sludge would be hauled by truck to a different approved disposal facility, about 60 miles away. Further analysis by the National Park Service would be needed to determine the preferred option for disposal of septic solids.

The new sewage treatment system would be designed to have sufficient capacity for projected additional sewage generated from future facilities proposed in the Willow Beach Development Concept Plan Amendment (NPS 1994). Additional septic tanks and effluent collection lines would be installed and connected to the system as new facilities were built.

The proposed system would meet Arizona standards for wastewater treatment. The system, as proposed, would be designed to operate during a 25-year flood and would be protected from a 100-year flood, as required by the state.

Alternative B would provide energy conservation by reducing pumping requirements. Septic effluent does not contain solids and can be pumped with low cost, high efficiency, low horsepower pumps. Estimated energy consumption will be 12,000 kilowatt hours per year.

ALTERNATIVE C

Under alternative C, the existing sewage lagoon system would be replaced with a new lagoon system. New lagoons would be built about 4,000 feet up Willow Beach Wash from the existing lagoons, and new sewage lines, lift stations, and a force main would be installed (figure 8 and figure 9).

The two existing sewage lagoons would be demolished; the remaining sludge and liners would be removed and disposed of appropriately. The lagoons would then be filled and the area re-contoured to level a site for construction of a future maintenance area.

About 1,800 linear feet of new 6-inch sewerline would be installed to collect sewage (by gravity) from Willow Beach facilities and deliver it to the existing upper sewage lift station. Raw sewage would then be pumped approximately 460 feet to the new lagoon site. Five manholes in the developed area would be repaired or replaced. Two lift stations would also be replaced and an additional lift station would be installed near the existing lagoon site to pump sewage up to the new lagoons.

New 4-inch diameter force main pipeline would be installed from the existing lagoon site to the new sewage lagoon site (about 4,000 feet). The old force main, from the Willow Beach developed area to the existing lagoon site (approximately 3,500 feet), would be replaced with new 4-inch force main. Underground electrical powerlines would also be extended to the new lagoon site to power a floating aerator.

Four to five new sewage lagoons with a combined surface area of about 131,400-square feet would be excavated/constructed within the dry wash channel. A series of lagoons would be required due to the wash's relatively steep slope (approximately 8%). Alluvial deposits (primarily sand and gravel) would be used to construct the lagoon embankments. A larger floodwater diversion berm or dike would be constructed from wash deposits and gabions upchannel from the lagoon area. This diversion structure, designed to withstand the probable maximum flood (i.e., floods with velocity of 12.0- to 16.7-feet per second and depths of 4.5 to 11.3 feet), would divert floodwaters to an adjacent subchannel to prevent flash flood damage to the lagoon facilities.

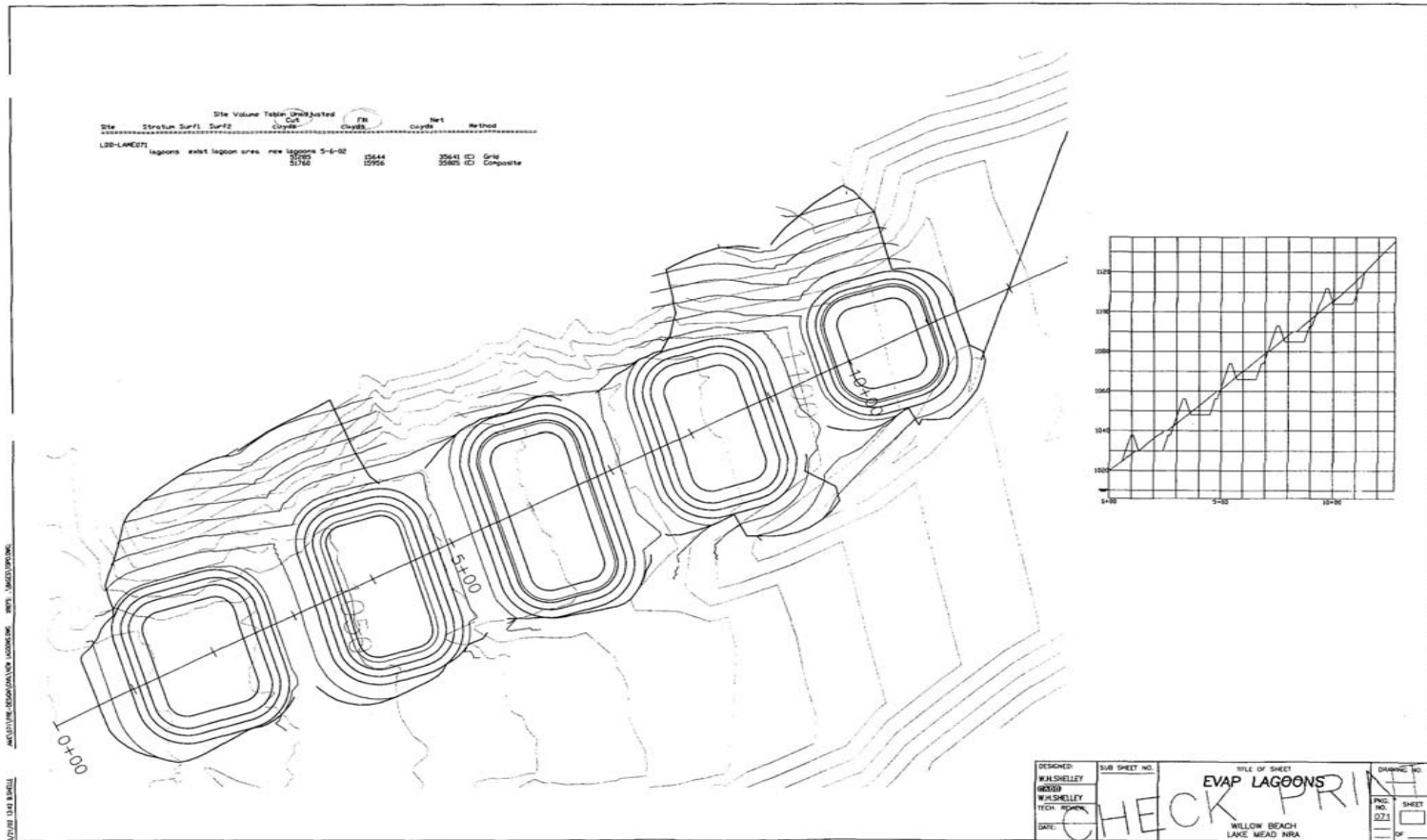


FIGURE 9. EVAPORATIVE LAGOONS DETAIL FOR ALTERNATIVE C AT WILLOW BEACH

The access road to the existing lagoon area would be repaired and extended using alluvial wash deposits as road base. Stabilization of slopes above the new lagoons would also be required.

The new treatment system would be designed to have sufficient capacity for projected additional sewage amounts from future facilities proposed in the Willow Beach Development Concept Plan Amendment (NPS 1994). Additional sewage collection lines would be installed and connected to the system as new facilities were built.

Alternative C would use approximately 3.5 times the energy required under alternative B. Raw sewage, which contains solids, requires solids handling pumps that are high cost, low efficiency, and high horsepower. Energy requirements for alternative C are estimated at 73,000 kilowatt hours per year.

The proposed system would meet Arizona standards for wastewater treatment. The system, as proposed, would be designed to operate in a 25-year flood and would be protected from a 100-year flood, as required by the state.

MITIGATION MEASURES FOR THE PREFERRED ALTERNATIVE

Mitigation measures were analyzed as part of the preferred alternative for improving the Willow Beach wastewater treatment system. Mitigation measures discussed below have been prepared to lessen or eliminate any potential adverse effects of the proposed action.

Visitor Safety and Experience

During construction, Lake Mead NRA visitors would be prevented from entering construction areas. Barricades and temporary construction fencing would be placed around construction areas to prevent visitor entry.

Worker Safety

The potential for flash floods exists during the monsoon season (between July and September) and poses a threat to workers. Therefore, construction activities will be avoided during this time period. If project work between July and September is unavoidable, a safety plan for working in desert washes would be formulated.

Construction Limits

Construction limits would be clearly marked with ribbons and stakes prior to the beginning of ground-disturbing activities. No disturbance would occur beyond these limits. Temporary construction fence would be installed, where determined necessary, by National Park Service project coordinators.

Water, Air Quality, and Noise

Erosion control measures would be implemented to minimize minor and short-term impacts to water quality. Sediment traps, erosion check structures, and/or filters would be considered. Best management practices are means of preventing or reducing nonpoint source pollution in watercourses and minimizing soil loss and sedimentation. Best management practices would minimize impacts to Willow Beach Wash and would include all or some of the following features, depending on site-specific requirements:

- Locating trash and other construction debris outside the wash (e.g., in the old trailer village site) to reduce the potential for nonpoint source pollution.
- Installing silt fences, straw bale barriers, temporary earthen berms, temporary water bars, sediment traps, stone check dams, brush barriers, or other equivalent measures, including installing erosion-control measures around the perimeter of temporarily stockpiled materials prior to and during construction.
- Conducting regular site inspections throughout the construction period to ensure that erosion-control measures are properly installed and function effectively.
- Storing, using, and disposing of chemicals, fuels, and other toxic materials properly.
- Refueling construction equipment in upland areas only, to prevent fuel spills near water resources.

Fugitive dust plumes would be reduced to the extent possible by sprinkling water during earth-disturbing activities. Airborne particulates would be increased in the area of construction during the work effort and for a time following its completion. Water used during road construction would be pumped from Lake Mohave and hauled by truck to the construction site. In the event that access to the lake was blocked (from visitation, public events, fish stocking, or other activity), permission to use water from fire hydrants would likely be granted.

Contractors would be required to use state-of-the-art noise reduction technology on construction equipment to the maximum extent practicable.

Revegetation

For much of the project site, revegetation work would be unnecessary because construction activities would occur in developed areas (parking lot or along the roadway), or in desert wash areas that are nearly devoid of vegetation and that are subject to natural disturbance.

Revegetation would use desert topsoil (conserved in the project site, where appropriate) and seeds from native species (genetic stocks originating in Lake Mead NRA). Revegetation efforts would attempt to mimic the natural spacing, abundance, and diversity of native plant species, where appropriate. No imported topsoil (desert soil) or hay bales would be used during revegetation in an effort to avoid introduction of non-native plant species.

Undesirable species such as Sahara mustard and saltcedar (*Tamarix ramosissima*), would be controlled in high-priority areas. Other undesirable species would be monitored and control strategies initiated if these species occur. To prevent the introduction of and to minimize the

spread of non-native vegetation and noxious weeds, the following measures would be implemented:

- Minimize soil disturbance.
- Pressure-wash all construction equipment before it is brought into Lake Mead NRA and before it is moved from one site to another.
- Limit vehicle parking to existing roads or parking lots.
- Obtain all fill, rock, or topsoil from the project area.
- Initiate revegetation of disturbed sites, where appropriate, immediately following construction activities by spreading desert soil with its associated seed bank.
- Monitor disturbed areas annually for two to three years following construction to identify noxious weeds or exotic vegetation, especially Sahara mustard. The treatment of exotic vegetation would be completed in accordance with Director's Order – 13: *Integrated Pest Management Guidelines*. Lake Mead NRA is developing a non-native vegetation management plan to address specifics and analyze alternatives related to the control of noxious weeds and non-native vegetation.

Desert soil would be stored, where appropriate, as close to its original location as possible to retain the local seed bank and soil type. Replacement of desert soil would include spreading and seeding and/or planting species native to the immediate area. As necessary, desert soil replacement techniques would be used to re-establish desert crust surface and minimize impacts from invasive plant species such as Russian thistle (*Salvola tragus*), which often occur on disturbed sites. Previous revegetation efforts in Lake Mead NRA indicate that certain non-native species may grow from these newly placed desert soils for the first two to three years of vegetation re-establishment.

To maximize restoration efforts after completion of construction activities, the following measures would be implemented, as appropriate:

- Salvage topsoil from construction areas for reuse during restoration of disturbed areas.
- Salvage native vegetation for subsequent replanting in the disturbed area.
- Monitor revegetation success for three years following construction.
- Implement remedial and control measures as needed.

Cultural Resources

Should previously undiscovered archeological resources be uncovered during construction, work would be halted in the discovery area, the site secured, and Lake Mead NRA would consult according to 36 CFR 800.13 and, as appropriate, provisions of the Native American Graves Protection and Repatriation Act of 1990. In compliance with the Native American Graves Protection and Repatriation Act of 1990, the National Park Service would also notify and consult concerned American Indian representatives for the proper treatment of human remains, funerary, and sacred objects, should these be discovered during the course of the project.

Known archeological deposits (site AZ:F:2:2) are not within the preferred alternative project disturbance limits and would be protected by maintaining the fill that covers it, monitoring ground disturbances, and recording any significant data that may be uncovered.

Consultation with appropriate American Indian tribes would also identify specific mitigation measures for offsetting adverse impacts to ethnographic resources, including traditional cultural properties, within the Willow Beach area.

Desert Tortoise

Based on records in Lake Mead NRA's wildlife observation database (LAME 2002b) sightings of desert tortoise (*Gopherus agassizii*) in the Willow Beach area are rare (two sightings in the past 35 years). Thus, this area is believed to represent very marginal desert tortoise habitat. Construction areas would be surveyed for desert tortoise sign by National Park Service-qualified, authorized biologists prior to construction. If desert tortoise burrows, dens, or other signs of desert tortoise use (e.g., scat, carcasses) are found during the survey, Lake Mead NRA standard construction mitigation measures related to desert tortoise protection would be implemented.

Sustainability

The National Park Service has adopted the concept of sustainable design as a guiding principle of facility planning and development. The objectives of sustainability are to design National Park Service facilities to:

- minimize adverse effects on natural and cultural values
- reflect their environmental setting
- maintain and encourage biodiversity
- construct and retrofit facilities using energy-efficient materials and building techniques
- operate and maintain facilities to promote their sustainability
- illustrate and promote conservation principles and practices through sustainable design and ecologically sensitive use

Essentially, sustainability is living within an environment with the least impact on the environment. The preferred alternative subscribes to and supports the practice of sustainable planning, design, and use of public and administrative facilities through mitigation, preparation, design, and materials.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

In accordance with Directors Order – 12, the National Park Service is required to identify the “environmentally preferred alternative” in all environmental documents, including environmental assessments. The environmentally preferred alternative is determined by applying the criteria suggested in NEPA, which is guided by the Council on Environmental Quality. The Council on Environmental Quality provides direction that “[t]he environmentally

preferable alternative to the alternative that will promote the national environmental policy as expressed in section 101 of NEPA, which considers:

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
2. Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings.
3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
4. Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.
5. Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources (NEPA, section 101).

Based on the above criteria, the environmentally preferred alternative is alternative B. In alternative B, the aging sewage disposal and treatment system would be replaced with a new system that treats sewage via septic tanks, a recirculating sand filter, and subsurface disposal. New force mains would be installed, deteriorated components would be replaced, a new access road would be constructed, and other site work would be conducted in support of the treatment system. Because alternative B would reduce the risk of health and safety exposures and would concentrate construction in already disturbed areas, this alternative best realizes criteria 1, 2, and 3 above. (The alternatives differ little with respect to criteria 4, 5, and 6). Alternative B fulfills the responsibilities of each generation as trustee of the environment for future generations, it ensures a safe and healthful environment, and attains beneficial uses of the environment without degradation, risk of health or safety, or other undesirable consequences.

Alternative A (no action) represents continuation of the existing condition (no improvements to the deteriorating wastewater treatment system at Willow Beach). Sewage collection and transmission lines leak while manholes, lift stations, and lagoon liners are deteriorating. State standards for treatment and disposal of effluent are not being met. The no-action alternative does not fully realize criteria 1, 2, and 3.

Under alternative C, the existing sewage lagoon system would be replaced with a new lagoon system. New lagoons would be built about 4,000 feet up the Willow Beach Wash from the existing lagoons, and new sewage lines, lift stations, and a force main would be installed. Although alternative C would provide better health and safety via improved sewage treatment, new sewage lagoons would be built in a previously undisturbed area, the system would substantially increase power usage, and a flood protection berm would alter the natural flow of stormwater runoff in Willow Beach Wash. Thus, alternative C does not fully realize NEPA criteria 1 and 3.

PERMIT AND CONSULTATION REQUIREMENTS

No new permits would be required for the no-action alternative; however, the facility would need to perform maintenance and operational changes in order to respond to the ADEQ Notice of Violation and Consent Order.

The following approvals, permits, or consultation from jurisdictional agencies would be required before either alternative B or C could be implemented:

- U.S. Army Corps of Engineers, Nationwide or Individual Permit (as appropriate), pursuant to section 404 of the Clean Water Act, for minor discharges of dredged or fill material in waters of the United States.
- Arizona Department of Environmental Quality, Aquifer Protection Permits, General Permit for Operation of a Sewage Collection System with Design Flows of 3,000 to 24,000 gallons per day, pursuant to Arizona Administrative Code, Title 18 (Environmental Quality), Chapter 9 (Department of Environmental Quality – Water Pollution Control), Article 3 (Aquifer Protection Permits), Part E – Type 4 General Permits, Section R18-9-E323.4.23.
- Arizona Department of Environmental Quality, Arizona Pollutant Discharge Elimination System General Permit for Stormwater Discharges Associated with Construction Activities pursuant to Arizona Administrative Code, Title 18, Chapter 9, Article 9 (Arizona Pollutant Discharge Elimination System), Part C – General Permits.
- Arizona Department of Environmental Quality, Arizona Pollutant Discharge Elimination System Applicator Registration, Bulk Biosolids, pursuant to Arizona Administrative Code, Title 18, Chapter 9, Article 10 (Arizona Pollutant Discharge Elimination System – Disposal, Use, and Transportation of Biosolids), Section R18-9-1004.
- Arizona SHPO – Concurrence that no historic properties will be affected and that effects from the project on historic and archeological resources have been taken into account, in accordance with section 106 of the National Historic Preservation Act.
- U.S. Fish and Wildlife Service – informal consultation regarding threatened and endangered species, in compliance with section 7 of the Endangered Species Act of 1973, as amended.

COMPARATIVE SUMMARY OF ALTERNATIVES

TABLE 1. COMPARATIVE SUMMARY OF ALTERNATIVES

Alternative A: No Action	Alternative B: Preferred Alternative	Alternative C
The National Park Service would continue to use the deteriorating sewage collection and treatment system at Willow Beach. The National Park Service would need to minimally respond to the Notice of Violation and Consent Order and bring the existing facility into compliance with state standards.	<p>Willow Beach wastewater treatment facilities would be replaced with a new system that treats sewage via septic tanks, a recirculating sand filter, and subsurface disposal.</p> <p>New force mains would be installed, deteriorated collection system components would be replaced, a new access road to the wastewater treatment area would be constructed, and other miscellaneous mechanical, civil, electrical, and site work would be conducted in support of the system. Existing sewage lagoons would be demolished.</p>	<p>Willow Beach wastewater treatment facilities would be replaced with a new sewage lagoon system.</p> <p>New lagoons would be built about 4,000 feet up Willow Beach Wash from the existing lagoons. New sewage lines, lift stations, and force mains would be installed. Existing sewage lagoons would be demolished.</p>

ALTERNATIVES CONSIDERED BUT DISMISSED FROM DETAILED ANALYSIS

The planning team considered two additional alternatives: (1) a wastewater treatment system consisting of septic tanks and a leachfield, and (2) a wastewater treatment system consisting of septic tanks, a constructed wetland, and subsurface effluent disposal. These alternatives were dismissed from detailed consideration in this environmental assessment, because the Value Analysis/Choosing By Advantages study indicated that neither would provide a good value, based on cost and the degree to which they would provide for health and safety, natural resource protection, odor control, operational efficiency, reliability, and sustainability.

COMPARATIVE SUMMARY OF ENVIRONMENTAL CONSEQUENCES

TABLE 2. COMPARATIVE SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Potential Environmental Impacts			
Impact Topic	Alternative A: No-Action	Alternative B: Preferred Alternative	Alternative C
Biotic Communities	The potential for sewage leaks to contaminate surface waters would have short-term, negligible, adverse impacts on fish, amphibians, and birds.	Replacement of the leaking/deteriorating wastewater treatment system would result in short- and long-term, beneficial effects on biotic communities. Long-term, negligible to moderate, adverse impacts to desert wash plant communities would be anticipated from construction of new force main pipeline, recirculating sand filter, and subsurface disposal field. Short-term, negligible to minor, adverse impacts on wildlife would occur from construction activities such as human presence and noise.	Replacement or repair of the leaking/deteriorating wastewater treatment system components at Willow Beach would result in short- and long-term, beneficial effects on biotic communities. The effects of construction-related activities on desert wash vegetation and wildlife are anticipated to be long term, minor to moderate, and adverse.
Threatened and Endangered Species	No impacts to threatened and endangered species	No impacts to threatened and endangered species	No impacts to threatened and endangered species
Floodplains and Water Quality	Partial or total failure of the flood protection berm could have short-term, beneficial effects on the floodplain of Willow Beach Wash by restoring natural morphology and processes. Potential discharges of effluent could have short- and long-term, minor to moderate, adverse impacts on water quality of the infiltrated lake water underlying the Willow Beach area. Impacts on surface water quality from erosion and sedimentation, and potential effluent discharges, would be short and long term, minor, and adverse.	Construction of flood protection berms would have long-term, minor, adverse impacts on floodplains. Replacement of the leaking/deteriorating wastewater treatment system would result in long-term beneficial effects on water quality in the Willow Beach area. Increased erosion, sedimentation, and turbidity during construction could have short-term, negligible to minor, adverse impacts on water quality. The use of construction equipment could have short-term, negligible, adverse impacts on water quality.	Diversion of flood flows around the new sewage lagoons into an adjacent subchannel of Willow Beach Wash would result in long-term, moderate, adverse impacts to floodplains. Long-term, beneficial effects on water quality in the Willow Beach area would result from replacement or repair of the leaking/deteriorating wastewater treatment system components. Increased erosion, sedimentation, and turbidity during construction could have short-term, minor to moderate, adverse impacts on water quality. The use of construction equipment could have short-term, negligible, adverse impacts on water quality.

Comparative Summary of Environmental Consequences

Potential Environmental Impacts			
Impact Topic	Alternative A: No-Action	Alternative B: Preferred Alternative	Alternative C
Soils	No new impacts to soils	Soil impacts from construction of the new wastewater treatment facility would be long term, negligible, and adverse.	Soil impacts from construction of the new wastewater treatment facility would be long term, minor, and adverse.
Air Quality	No new impacts on air quality	Impacts to air quality from dust and construction equipment emissions would be short term, negligible to minor, and adverse.	Impacts to air quality from dust and construction equipment emissions would be short term, negligible, and adverse.
Ethnographic Resources	No known impacts to ethnographic resources	It is anticipated that impacts to ethnographic resources would be short- and long-term, negligible, and adverse, as a result of construction activities in areas affiliated with the Ha'tata and Salt Song Pathway.	It is anticipated that impacts to ethnographic resources would be short- and long-term, negligible, and adverse, as a result of construction activities in areas affiliated with the Ha'tata and Salt Song Pathway.
Visitor Use and Experience	Temporary closure of the Willow Beach wastewater treatment facilities for maintenance would have negligible to minor, short-term, adverse impacts on visitor use and experience.	Minor, short-term, adverse impacts on visitor use and experience are anticipated from construction activities.	Minor, short term, adverse impacts on visitor use and experience from construction activities.
Health and Safety	The potential contamination of groundwater in the Willow Beach area could have short-term, negligible, adverse impacts on health and safety. Activities involving confined space entries and work in a flash flood zone would have short- and long-term, negligible to minor, adverse impacts on the safety of Lake Mead NRA staff or contractors.	Short- and long-term, beneficial effects to health and safety would be anticipated from the replacement of the leaking and deteriorating wastewater treatment system at Willow Beach, as well as the reduction in odors associated with the system.	Short- and long-term beneficial effects to health and safety are anticipated from repair or replacement of the leaking and deteriorating wastewater treatment system components at Willow Beach.

AFFECTED ENVIRONMENT

BIOTIC COMMUNITIES

This section describes the biotic environment of Willow Beach Wash and the adjacent Willow Beach Developed Area. The existing vegetation and wildlife subsections of mammals, birds, reptiles, amphibians, and fisheries are described. Threatened and endangered species and species of concern are addressed in the following section.

Vegetation

Introduced landscape vegetation is present in the developed portion of Willow Beach and primarily includes the date palm (*Phoenix dactylifera*), desert fan palm (*Washingtonia filifera*), oleander (*Nerium oleander*), and Bermuda grass (*Cynodon dactylon*). The non-native shrub saltcedar is present, as are the natives Fremont cottonwood (*Populus fremontii*), desert willow (*Chilopsis linearis*), and mesquite (*Prosopis glandulosa*) (figures 10 and 11).

Willow Beach Wash is considered a desert wash of moderate to large size at Lake Mead NRA. It contains a gravel bottom and deposits of fine sediments. In some places, the wash flows around ridges of gypsum soils or desert soils hardened by gravel-sized desert pavement. Willow Beach Wash drains adjacent hills composed of gypsum and desert soil deposits. Willow Beach Wash vegetation is less than 5% aerial cover and is dominated by sparse cheesebush (*Hymenoclea salsola*), sweetbush (*Bebbia juncea*), brittlebush (*Encelia farinosa*), and creosote bush (*Larrea tridentata*). Less common shrubs included catclaw acacia (*Acacia greggii*), mesquite (*Prosopis* sp.), Nevada ephedra (*Ephedra nevadensis*), four-wing saltbush (*Atriplex canescens*), and Parry sandpaper plant (*Petalonyx parryi*) (figures 12 and 13), as well as saltcedar. Forb and grass species are dominated by non-native London rocket (*Sysimbrium irio*) and Mediterranean grass (*Schismus arabicus*). Other forb and grass species observed in the desert washes include big galleta grass (*Pleuraphis rigida*), annual grasses such as red brome (*Bromus rubens*), plantain (*Plantago* sp.), spurge (*Chamaesyce* sp.), desert trumpet (*Eriogonum inflatum*), and Russian-thistle. Uplands adjacent to Willow Beach Wash are primarily barren or sparsely vegetated outcrops of sedimentary rocks and gypsum hills and ridges (figure 14). Generally, the proposed site for the new wastewater treatment system is dominated by non-native forbes, degraded from the construction of the original sewage lagoons and the spraying of water over large areas. Although adjacent wash vegetation was dominated by native vegetation, the dominant plant is cheesebush, indicating that the area has been repeatedly disturbed.



FIGURE 10. LANDSCAPE VEGETATION OF THE WILLOW BEACH DEVELOPED AREA



FIGURE 11. SHORELINE VEGETATION OF THE WILLOW BEACH DEVELOPED AREA



FIGURE 12. VEGETATION OF WILLOW BEACH WASH



FIGURE 13. VEGETATION OF WILLOW BEACH WASH



FIGURE 14. UPLANDS ADJACENT TO THE WILLOW BEACH SITE

WILDLIFE

Mammals

Of the 70 mammal species listed for Lake Mead NRA, bats comprise 24% (17 species), and 37% (26 species) are considered adapted to live at the lower elevations (Schwartz et al. 1978). Mammals commonly observed in Lake Mead NRA and that may occur in the project area include desert bighorn sheep (*Ovis Canadensis nelsoni*), black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), ground squirrels (*Spermophilus* sp.), woodrat (*Neotoma* sp.), deer mouse, (*Peromyscus maniculatus*), coyote (*Canis latrans*), and the kit fox (*Vulpes macrotis*) (NPS 1994).

Birds

Species commonly observed in the desert shrub communities of Lake Mead NRA include the common raven (*Corvus corax*), horned lark (*Eremophila alpestris*), the greater roadrunner (*Geococcyx californianus*), and the rock wren (*Salpinctes obsoletus*) (NPS 1994). The creation of Lakes Mead and Mohave and the associated aquatic, wetland, and riparian habitats, has expanded the habitat for waterfowl and shorebirds at Lake Mead NRA. A large group of

double-crested cormorants (*Phalacrocorax auritus*) and mallards (*Anas platyrhynchos*) were observed near the shoreline of Lake Mohave during a November 2002 walk through the site. Other species of birds that may use the aquatic and shoreline habitat of Lake Mohave at Willow Beach include the pied-billed grebe (*Podilymbus podiceps*), great blue heron (*Ardea herodias*), and the killdeer (*Charadrius vociferous*) (LAME 2003).

Reptiles and Amphibians

Reptiles most likely to occur in the desert environments of the Willow Beach area include rattlesnakes (*Crotalus* sp.), the gopher snake (*Pituophis catenifer*), western banded gecko (*Coleonyx variegatus*), desert iguana (*Dipsosaurus dorsalis*), zebra-tailed lizard (*Callisaurus draconoides*), collared lizard (*Crotaphytus collaris*), leopard lizard (*Crotaphytus wislizeni*), side-blotched lizard (*Uta stansburiana*), desert horned lizard (*Phrynosoma platyrhinos*), and western whiptail (*Cnemidophorus tigris*). The desert toad (*Bufo punctatus*), Woodhouse's toad (*B. woodhousei*), leopard frog (*Rana pipiens*), and bullfrog (*R. catesbeiana*) are the most common amphibians expected for the project area (Schwartz et al. 1978). It is more likely that these species occur near the developed area, the shoreline/aquatic environments of Lake Mohave, and in the more mesic lower portions of desert washes adjacent to the lake than in Willow Beach Wash.

Fishery

Following the completion of Hoover Dam in 1935, the warm, silt-laden Colorado River was changed into a cold, swift-flowing stream by the releases of stored water from the dam. Stocking of rainbow trout (*Oncorhynchus mykiss*) began in 1935, and a world class trout fishery soon developed because the river through the Black Canyon reach maintained a fairly constant 55° Fahrenheit water temperature. The Willow Beach National Fish Hatchery, operated by the U.S. Fish and Wildlife Service, stocks Lake Mohave with rainbow trout because natural reproduction does not occur. No striped bass (*Morone saxatilis*) have been planted in Lake Mohave by federal or state agencies, but a viable population has become established. Predation by striped bass has had a detrimental effect on the trout population, but rainbow trout and striped bass are still the major sport fish in northern Lake Mohave (NPS 1994). Other species of game fish in Lake Mohave include largemouth bass (*Micropterus salmoides*), catfish (*Ictalurus* sp.), crappie (*Pomoxis* sp.), and bluegill (*Lepomis macrochirus*) (NPS 2002a).

THREATENED AND ENDANGERED SPECIES AND SPECIES OF CONCERN

Under the Endangered Species Act, an endangered species is defined as any species in danger of extinction throughout all or a significant portion of its range. A threatened species is defined as any species likely to become an endangered species in the foreseeable future throughout all or a significant portion of its range. The U.S. Fish and Wildlife Service maintains a list of federally listed, proposed, and candidate species for Mohave County, Arizona, and that list was consulted for determining the species that may occur within the project area (see appendix B). After consulting the Listing of Threatened and Endangered Species maintained by the U.S. Fish and

Wildlife Service (January 2003), it was determined that the razorback sucker and bonytail chub, both federally listed as endangered, have designated critical habitat in Lake Mohave.

The razorback sucker was once abundant in the rivers of the Colorado River Basin, but is now limited in distribution. In the Lower Colorado River Basin, the razorback sucker occurs in the Colorado River from the Grand Canyon to near the border with New Mexico (USFWS 1994). With the exception of the relatively large stock of razorback suckers remaining in Lake Mohave (an estimated 25,000 individuals), these populations are small and recruitment (the amount of fish added to a fishery each year due to growth and/or migration) is virtually nonexistent. The formerly large Lower Basin populations have been virtually extirpated from other riverine environments (USFWS 1994).

In the Upper Colorado River Basin, the razorback sucker occurs in the lower Yampa and Green Rivers, mainstream Colorado River, and lower San Juan River; however, there is little indication of recruitment in these remnant stocks. The largest population in the Upper Basin was known to occur in the upper Green River Basin, which was estimated to support 1,000 fish in 1989, and only 500 in 1994 (USFWS 1994).

Habitat use and reproduction of razorback suckers has been studied in Lower Basin reservoirs, especially Lake Mohave. In nonreproductive periods, adult razorback suckers occupied a variety of habitat types, including impounded and riverine areas, eddies, backwaters, gravel pits, flooded bottoms, flooded mouths of tributary streams, slow runs, and sandy riffles (USFWS 1994). Summer habitats used included deeper eddies, backwaters, holes, and midchannel sandbars. During winter, adult razorback suckers use main channel habitats that are similar to those used during other times of the year, including eddies, slow runs, riffles, and slackwaters (USFWS 1994).

Reproduction of razorback suckers has been visually observed along reservoir shorelines, including Lake Mohave. The fish spawn over mixed substrates that range from silt to cobble and at water temperatures that range from 51 to 70 degrees Fahrenheit (USFWS 1994). Fish in the Green River Basin are known to spawn in the spring with rising water levels and increasing water temperatures. Razorback suckers tend to move into the flooded areas in early spring and begin spawning migrations to specific locations as they become reproductively active (USFWS 1994). In this riverine environment, the fish spawn over rocky runs and gravel bars. Most studies indicate that razorback sucker larvae prefer shallow, shoreline areas for a few weeks after hatching, then disperse to deeper water areas (USFWS 1994).

Based on available data, factors that potentially limit the survival, successful reproduction, and recruitment of the razorback sucker include the following:

- Interactions with non-native fish.
- High winter flows; reduced high spring flows.
- Seasonal changes in river temperatures.
- A lack of inundated shorelines and bottomlands.

The bonytail chub (also known as the bonytail) is the rarest native fish in the Colorado River Basin (USFWS 1994). Historically reported as widespread and abundant in rivers throughout the Basin, its populations have been greatly reduced. The fish is presently represented in the

wild by a low number of old fish (i.e., ages of 40 years or more), and recruitment is virtually nonexistent (USFWS 1994). In the Lower Colorado River Basin, a small population persists in the Colorado River in Lake Mohave, as well as Lake Havasu. In the Upper Colorado River Basin, captures have occurred in Dinosaur National Monument (Colorado) on the Yampa River, Desolation and Gray Canyons on the Green River, and Black Rocks and Cataract Canyon on the Colorado River (USFWS 1994).

The bonytail chub is adapted to mainstream rivers where it has been observed in pools and eddies. In reservoirs, the fish generally occupies a variety of habitat types, while in Lake Mohave, bonytail chub have been observed in eddy habitats (USFWS 1994). Spawning requirements have never been documented in a river, but it has been reported that spawning has occurred in June and July at water temperatures about 64° Fahrenheit (USFWS 1994), although reports from Lake Mohave have indicated spawning in May (NatureServe 2003).

Decline of the bonytail chub is due, at least in part, to habitat destruction (diversion and impoundment of rivers) and competition and predation from exotic fish species (NatureServe 2003). Available data suggests that habitats required for conservation of the bonytail chub include river channels and flooded, ponded, or inundated riverine habitats that would be suitable for adults and young, especially if there is reduced competition from non-native fishes (USFWS 1994).

As mentioned previously, the U.S. Fish and Wildlife Service designated the Colorado River from Hoover Dam to Davis Dam, including Lake Mohave up to its full pool elevation, as critical habitat for the razorback sucker and bonytail chub in 1994 (USFWS 1994). *Critical habitat*, as defined in section 3(5)(A) of the Endangered Species Act, means:

- a) "...the specific areas within the geographical area occupied by the species at the time it is listed..., on which are found those physical and biological features (I) essential to the conservation of the species, and (II) which may require special management considerations or protections.
- b) ...specific areas outside the geographical area occupied by a species at the time it is listed..., upon determination by the Secretary [of the Interior] that such areas are essential for the conservation of the species."

The critical habitat designation helps focus conservation activities by identifying areas that contain essential habitat features (primary constituent elements) regardless of whether or not the areas are currently occupied by the listed species. For the razorback sucker and bonytail chub, these included:

1. Water quantity, quality, (i.e., temperature, dissolved oxygen, lack of contaminants, nutrients, turbidity, etc.) and hydrologic regime.
2. Physical habitat such as river channels, bottom lands, side channels, secondary channels, oxbows, backwaters, and the areas in the 100-year floodplain, that when inundated provide spawning, nursery, feeding, and rearing habitats, or access to these habitats.
3. The biological environment, including food supply, predation, and competition. Such designations alert federal agencies, states, the public, and other entities about the importance of an area for the conservation of a listed species (USFWS 1994).

Critical habitat also identifies areas that may require special management or protection. Areas designated as critical habitat receive protection under section 7 of the Endangered Species Act, with regard to actions carried out, funded, or authorized by a federal agency that are likely to adversely modify or destroy critical habitat.

Two other species on the U.S. Fish and Wildlife Service list have the potential to occur in the project area—the desert tortoise and the bald eagle (*Haliaeetus leucocephalus*). Based on records in Lake Mead NRA’s wildlife observation database (LAME 2002b) sightings of desert tortoise in the Willow Beach area are rare (two sightings in the past 35 years). Thus, this area is believed to represent very marginal desert tortoise habitat. Bald eagles are likely to be transient to the area (flying over while foraging).

FLOODPLAINS AND WATER QUALITY

The desert wash tributaries to Willow Beach Wash are subject to flash flooding resulting from intense thunderstorms over the area that typically occur in July, August, and early September. The project area, including the developed portion, is located entirely within the 100-year and probable maximum floodplain of Willow Beach Wash (NPS 1994), which drains directly into Lake Mohave (figure 15). The 100-year flood is the average maximum flood that can be expected to occur every 100 years or that has a 1% chance of occurring in any given year. The probable maximum floodplain is related to the largest flood that can reasonably be expected to occur in a drainage. These floods are rare, and their statistical probability of occurring is uncertain (NPS 1994).

Water quality within Lakes Mead and Mohave is threatened by external sources such as Las Vegas Wash and the Virgin and Muddy Rivers, and internal sources such as Lake Mead NRA wastewater treatment, human sanitation, and gasoline and oil from boats and personal watercraft. Ultimately, the National Park Service has a duty under law to protect the waters of Lakes Mead and Mohave (NPS 2002a). The highest established standard for water quality in both Nevada and Arizona is for swimming (full body contact). The full body contact designation is also the highest bacteriological protected use. Other protected uses may be limited for other parameters such as temperature, chemical quality, or anti-degradation. Fishing is also an important visitor activity with established water quality standards.

Lake Mohave provides an environment for aquatic life and for human recreation uses such as swimming, water skiing, windsurfing, fishing, and boating. The *Lake Mead National Recreation Area Resource Management Plan* (1999) identifies a number of internal effects on water quality at the lake, including heavy recreation use (producing pollution from human waste and litter), and boat use in harbors (producing pollution from illegal sewage discharge and petrochemical spills). External effects on water quality include the assortment of pollutants transported to the lake by tributaries, deposition of air pollutants into lake water, and impacts from adjacent land uses and increasing development.

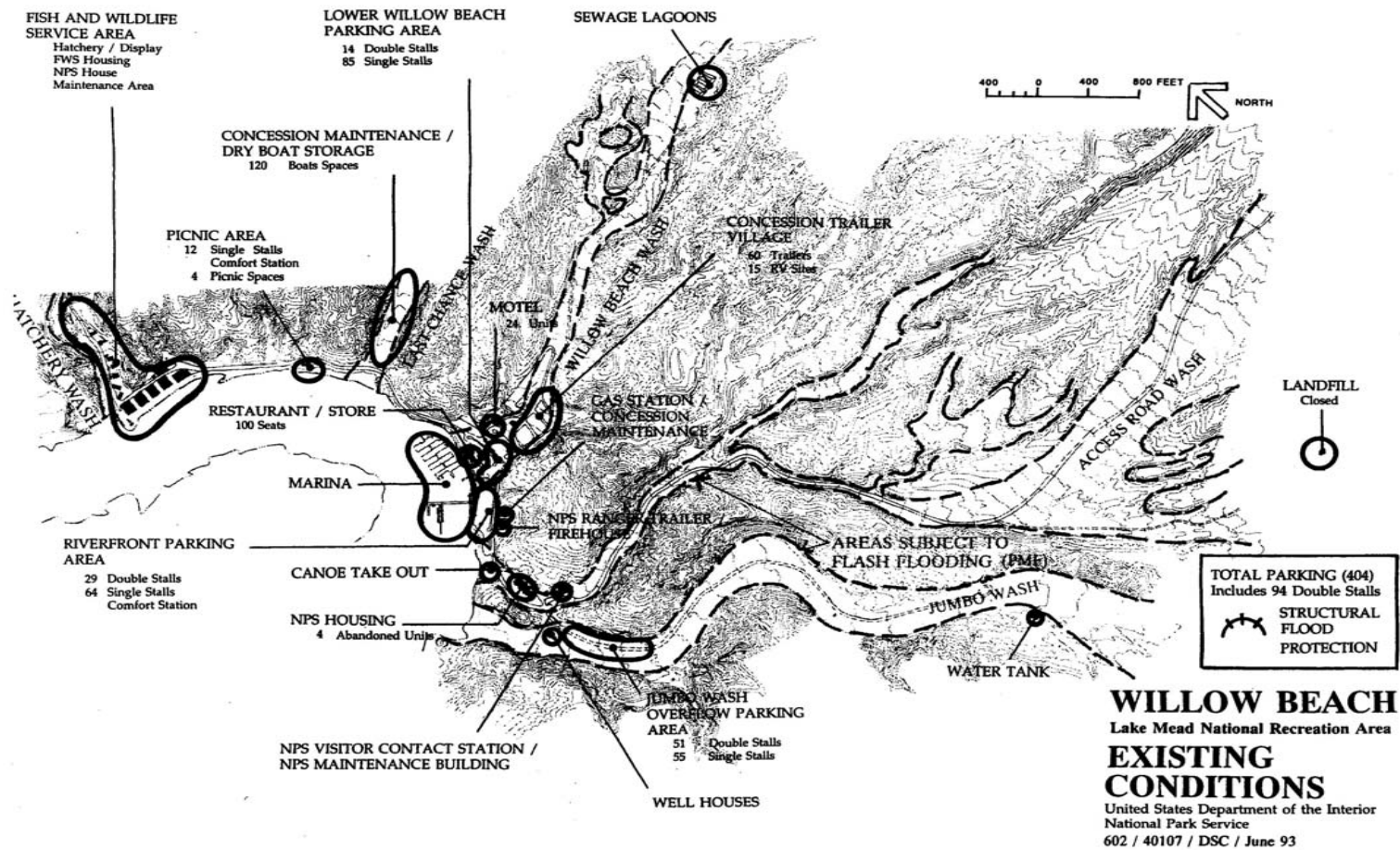


FIGURE 15. 100-YEAR AND PROBABLE MAXIMUM FLOODPLAIN BOUNDARIES FOR WASHES AT WILLOW BEACH

Infiltrated lake water at Willow Beach occurs in substantial quantities in the wash gravel at the approximate elevation of the river. One of the greatest threats to the surface and groundwater quality at Willow Beach is a sewage spill resulting from system failures and leaching of sewage into Lake Mohave or the infiltrated lake water. One key issue revolves around the overall deteriorated condition of the existing wastewater facilities and the fact that there is known loss of water tightness and integrity of existing lift station wet wells, despite ongoing repair and response to such situations. These conditions allow seepage of wastewater into the saturated zone, and acts as a source of contamination of water infiltrating Lake Mohave (LAME 2002).

SOILS

A geotechnical exploration was conducted for areas of Willow Beach Wash in 2002 (NPS 2002). The two sites sampled were immediately below the existing lagoons, and approximately 1,900 feet upstream of the existing lagoons. The native soils encountered during the exploration consisted of sandy gravel, clayey sand, gravelly sand, and silty sand. Interlayered silty and clayey sand and sandy clay soils (interpreted as weathered bedrock) were encountered at depths of 8 to 18 feet. The coarse-grained soils were typically medium dense to very dense and the fine-grained soils were typically impermeable in consistency (NPS 2002).

AIR QUALITY

Lake Mead NRA is designated a Class II air quality area under the Clean Air Act of 1972, as amended. Air quality within the region is generally good, but some degradation of air quality occurs at lower elevations of Lake Mead NRA. Air pollutants are generated primarily from outside the recreation area, but can concentrate in Lake Mead NRA, especially during periods of atmospheric inversion. Major sources of air pollutants within or adjacent to the recreation area include: the Mojave power generating plant near Laughlin, Nevada; emissions from motor vehicles from the Las Vegas valley and other urban areas; gravel and gypsum quarries; fugitive dust from disturbed lands and construction activities; and other power generating plants in the region.

The recreation area has spectacular vistas and scenic areas around both Lakes Mead and Mohave; however, visible smog sometimes results in degraded air quality. Preserving air quality is integral to providing high quality recreational experiences.

CULTURAL RESOURCES

Historic Overview

Prehistory

Archeologists have identified a series of American Indian cultures that occupied Lake Mead NRA and adjacent areas in southern Nevada and Western Arizona over the last 12,000 to 13,000

years. Occupation by these cultures has been divided into discrete time periods based on various criteria, i.e., changes in technology, the types of animals and plants used for food, or the migration of people into and out of the area.

Occupation of the area began at the end of the Late Pleistocene, around 12,000 to 13,000 years ago, with cultures of the Paleoindian period. The Paleoindian period lasted into the Holocene and ended around 7,000 years before present. The Pleistocene was characterized by greater rainfall and moderate temperatures, which created an environment of vast lakes and humid conditions. Later, during the Paleoindian period of the early Holocene, the environmental conditions shifted to warmer and dryer conditions. Paleoindian cultures lived in small, highly nomadic groups, utilized wild plant foods, and hunted now-extinct big game. Physical remains from the Paleoindian period usually consist of flaked stone tools and the byproducts of tool manufacture, e.g., flakes and spent cores.

The Archaic period (7,000 to 2,000 years before present) is characterized by nomadic peoples living in small groups adapted to the mosaic of microenvironments created by the overall warmer and dryer conditions that existed during the Pleistocene. Their subsistence was based on gathering wild plant foods and hunting small game. Flaked stone tools and the byproducts of tool manufacture, along with the common occurrence of ground stone artifacts, typify the Archaic period.

The arrival of Anasazi culture from the east marked the end of the Archaic period and the beginning of the Saratoga Springs period. The Saratoga Springs period (2,000 to 750 years before present) was dominated by the expansion of the Virgin Anasazi into the Lake Mead NRA area, and their eventual withdrawal. The Virgin Anasazi were Puebloan people who used pottery and lived in permanent structures, which changed from pithouses to above-ground Puebloan-type room structures over the period of occupancy. They practiced some horticulture, but still depended heavily on wild plant and animal foods.

The Late Prehistoric lifeway, which began around 750 years before present, was similar to Archaic adaptations. The people lived in small mobile groups, gathered wild plant foods, and hunted small game. They also practiced small-scale horticulture. Archeologically, these people are indistinguishable from the Mojave, Quechan, Hualapai, and Havasupai (Yuman-speaking peoples) and the Southern Paiute (Numic-speaking peoples) who occupied the area during the Historic period (LAME 2002).

Euro-American History

The Spanish, and later the Mexicans, were the first non-Indians to explore the area. During the Spanish/Mexican period (1500s to 1840s) trade routes were established between the population centers in New Mexico and the colonies in California. These trade routes included the Mojave Trail and the Old Spanish Trail, which passed through Southern Nevada (LAME 2002).

Ethnographic Resources

Previous tribal consultations conducted for the Willow Beach Development Concept Plan, as well as the subsequent phases of plan implementation, identified 17 contemporary American

Indian tribal communities who claim substantial interest in the Willow Beach area. It is located along “Ha’tata,” or the backbone of the river; the Colorado River corridor is important in the songs, spiritual beliefs and traditions for these tribes (Pepito pers. comm. 2002). This area in Lake Mead NRA lies within a NRHP eligible traditional cultural property recognized by the National Park Service and the Arizona and Nevada SHPOs (NPS 2001c). The property encompasses a geographic area that includes Gold Strike Canyon on the Nevada side, and Sugarloaf Mountain on the Arizona side. Previous planning efforts for the Hoover Dam Bypass Project have identified features of this traditional cultural property that are of particular importance to the American Indian Tribes (NPS 2001c); however, none of these related specifically to the Willow Beach area (Ruppert pers. com.2003). Tribal consultations for this project phase of the Willow Beach Development Concept Plan continue to be conducted.

None of the tribes consulted for the development concept plan expressed concerns about the proposal in general, but some indicated a continued concern about disturbing Willow Beach Site (AZ:F:2:2) (NPS 1994a). This site is outside the area of potential effect and would not be disturbed by any of the proposed alternatives.

VISITOR USE AND EXPERIENCE

The Willow Beach area is within a 1.5-hour drive from Las Vegas, and within a 6-hour drive from densely populated portions of southern California. It can be reached by vehicle via a 4-mile spur road that connects with U.S. Highway 93. Visitation tends to fluctuate more at Willow Beach than most other Lake Mead NRA developed areas, and fluctuations from year to year often exceed 10%. In 2002, Willow Beach visitation was 203,501 and in 2001 it was 199,942.

Willow Beach serves primarily as a day-use lake access point, and accommodates recreation in the form of fishing, picnicking, and enjoying views. It provides boat access to northern Lake Mohave and the Black Canyon. Black Canyon, with its narrow, enveloping and isolating terrain, provides opportunities for intimate and tranquil visitor experiences, in contrast to more open, heavily used areas of Lake Mead NRA.

Willow Beach was once a popular trout fishing area, but fishing use has diminished due to the decline of the trout fishery. Boating, rafting, and canoeing in the Black Canyon to enjoy scenery, fishing, and hot springs are popular (figure 16). Visitor services at Willow Beach presently include a marina, houseboat rentals, boat ramp, picnic area, store, and restrooms. A campground, motel, trailer village, and dry boat storage facilities have been closed in recent decades due to flash flood safety concerns, and these facilities are being gradually removed.

HEALTH AND SAFETY

This project involves construction and operation of a wastewater treatment facility within the bed of Willow Beach Wash. Unique health and safety hazards are associated with working in an area with the potential for flooding, and the operation of a wastewater treatment facility. These conditions are, therefore, discussed separately here, but it should be noted that they are

sometimes related (e.g., operation of a wastewater treatment facility in a flood zone requires considerations that operation of such a facility outside of a flood zone would not).



FIGURE 16. BOATING RECREATION ON LAKE MOHAVE AT WILLOW BEACH

Existing Flood Conditions

Willow Beach Wash drains a 4.4-square-mile area and has a channel slope of 755-feet per mile along its 3.7-mile length. This wash has an extremely steep slope in the mountain headwaters, much flatter slopes in the alluvial fans in its middle reaches, and increases in steepness as it cuts through the lower, rocky zone near Lake Mohave. As the wash narrows prior to entering the lake, flows are confined between rock walls with side slopes of 1:2 or steeper rates (figure 17) (NPS 1980).

These physical conditions make Willow Beach Wash vulnerable to flash flooding with the potential to damage National Park Service and visitor use facilities, visitor property (e.g., cars, trailers, boats), and even cause loss of life. Such a flood has occurred previously in Lake Mead NRA. In September 1974, a major flash flood in Eldorado Canyon (about 12 miles south of Willow Beach on the west shore of Lake Mohave) caused nine deaths and extensive damage to fixed facilities, parked cars, mobile homes, and boats moored at Nelson's Landing Marina (NPS 1980).

LINSLEY, KRAEGER ASSOCIATES

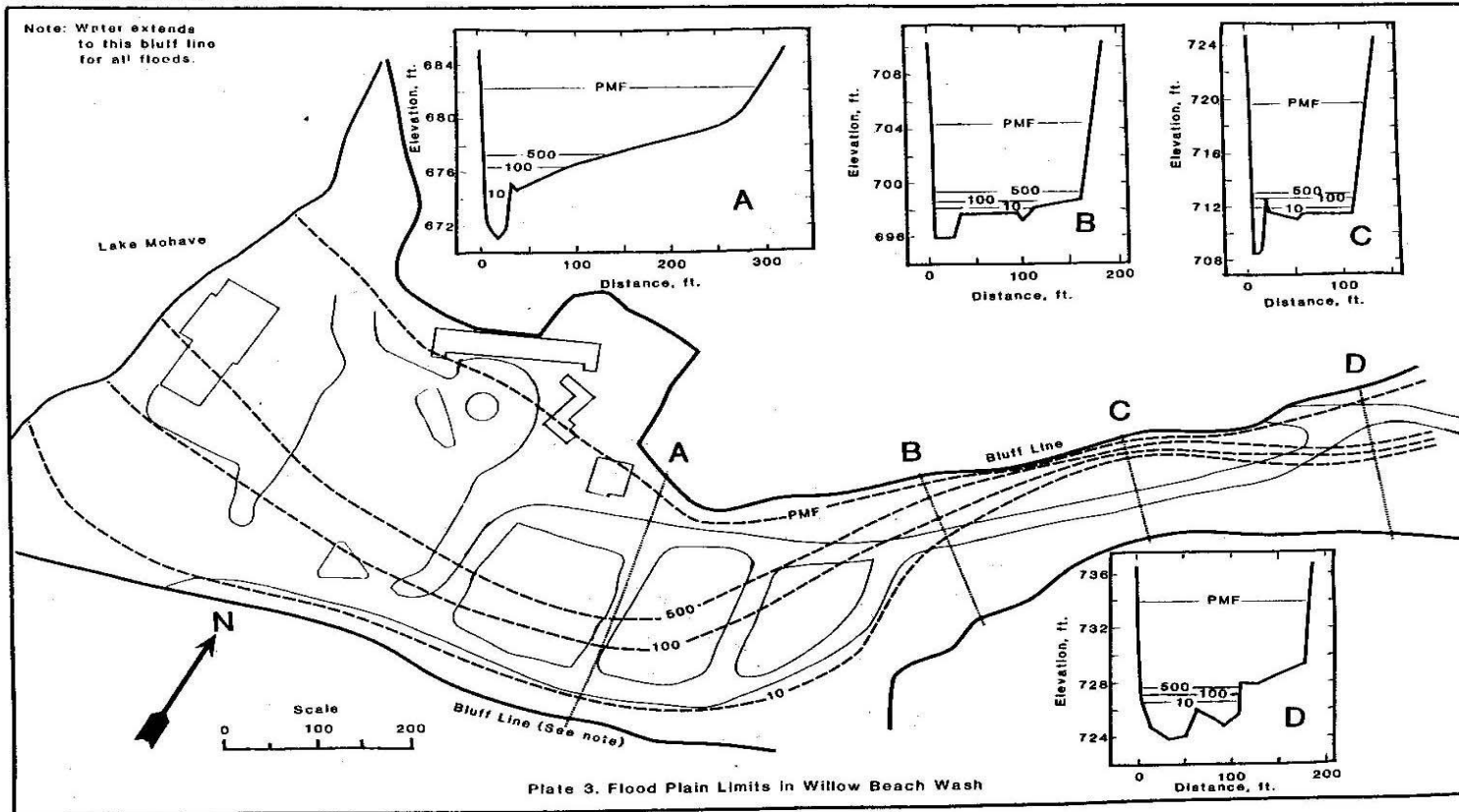


FIGURE 17. CHANNEL PROFILE OF WILLOW BEACH WASH NEAR THE DEVELOPED AREA

The National Park Service calculated that about 32 minutes would be required for a flood starting in the most remote part of Willow Beach Wash to reach Lake Mohave, using a conservative estimate for the average water velocity of a probable maximum flood (10-feet per second [fps]) (NPS 1980). Therefore, a rain event starting over the middle or lower portions of the wash, or flows with a velocity greater than 10-fps, could cause floods that require much less time to reach the developed area at Willow Beach. The characteristics and hazards of various flood scenarios are provided in table 3.

TABLE 3. CHARACTERISTICS AND HAZARDS OF 5-TO 25-YEAR FLOODS, 50- TO 100-YEAR FLOODS, 500-YEAR FLOODS, AND PROBABLE MAXIMUM FLOODS

Flood Interval	Characteristics	Hazards
2 Years	Water Depths: 0.8 to 3.4 feet Mean Velocities: 5.1 to 9.4 fps	Could be dangerous for children and handicapped individuals; could float cars and trailers
5 to 25 Years	Water Depths: 1.1 to 3.7 feet Mean Velocities: 5.3 to 9.7 fps Flood would generally exceed the channel capacity at some point and begin to spread out across the canyon floor	Would be dangerous for children, handicapped individuals, and adults; could float cars and trailers
50 to 100 Years	Water Depths: 1.2 to 5.1 feet Mean Velocities: 6.4 to 8.4 fps Will flood the canyon from cliff-to-cliff at one or more sections in the wash	Would be dangerous for children, handicapped individuals, and adults; would likely float cars and trailers; could cause damage to fixed facilities
500 Years	Water Depths: 1.8 to 6.3 feet Mean Velocities: 7.6 to 8.4 fps Floods the entire canyon cliff-to-cliff throughout the wash	Could cause loss of life for children, handicapped individuals, and/or adults; would float cars and trailers; would likely cause damage to fixed facilities
Probable Maximum Flood	Water Depths: 4.5 to 11.3 feet Mean Velocities: 12.0 to 16.7 fps Floods the entire canyon cliff-to-cliff throughout the wash	Would likely cause loss of life for children, handicapped individuals, and/or adults; would float cars and trailers; would cause damage to fixed facilities

Source: National Park Service 1980

A rough rule of thumb is that a healthy human adult can withstand a combination of flood velocity and depth whose product is 10, i.e., 2-fps and 5-feet deep, or 5-fps and 2-feet deep. Children, because of their small weight and height, would have serious difficulty at depths or velocities much lower than those that an adult might withstand. Handicapped persons could experience great difficulty in a flood with a depth of one foot and relatively low velocities (NPS 1980). However, this discussion applies to flood waters that are largely sediment free. If the flow is carrying very large sediment loads, chances of survival are sharply reduced. As sediment brought down during a rain event has been noted for flood incident reports in the Willow Beach area (NPS 1980), it is anticipated that sediment transport would occur and would be very large during a probable maximum flood. It should also be noted that buoyant forces at depths of 2 to 3 feet are usually sufficient to float an automobile or trailer (NPS 1980).

Hazards of Wastewater Treatment Facility Operation

Health and safety concerns of operating a wastewater treatment facility relate primarily to water contamination, especially given the location of this facility within Willow Beach Wash.

The potential exists for groundwater contamination from leaking wet wells, transmission lines, pipes, check valves, and deteriorating sewage lagoons. As this groundwater eventually infiltrates the water of Lake Mohave, there is the risk of subsequently contaminating surface water as well.

An above-ground sewage spill could directly contaminate surface water of Lake Mohave if it were in the Willow Beach developed area, or should a storm event carry spilled contaminants from up the wash. Additionally, without proper flood protection, operation of a wastewater treatment facility in Willow Beach Wash could be prone to damage from flooding. Floods could cause a failure of the system, resulting in a sewage spill, or could sweep the entire facility downstream towards Lake Mohave, depending on the amount of associated bed scour.

Odors are also of concern relative to the operation of a wastewater treatment facility. At Willow Beach, in addition to odors from the facility itself, odors from fish cleaning stations are an issue (figure 18). Wastewater odors are generally the result of the production of hydrogen sulfide and methane gas, which are byproducts of the anaerobic biological decomposition of sewage solids.

In addition, there are health and safety concerns for Lake Mead NRA staff involved in operating and maintaining the wastewater treatment facility. These are generally related to lifting cast iron manhole and septic tank lids; entering confined spaces through manholes to access the underground infrastructure of the system; electrical shock; slip/trip hazards; heat-related illness; and working in an area prone to flash flooding. Also, working with a wastewater treatment facility increases the chances for exposure to micro-organisms (e.g., bacteria that decompose solids) that could have adverse health effects.



FIGURE 18. FISH CLEANING STATION AT WILLOW BEACH

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This section describes the environmental consequences of the no-action and other alternatives. First, the methods for assessing environmental consequences are discussed because NEPA requires consideration of context, intensity, and duration of impacts, cumulative impacts, and measures to mitigate impacts. Next, is an explanation of resource impairment, which must also be assessed by alternative for particular topics, according to National Park Service policy. Subsequent sections in this chapter are organized by impact topic, first for the no-action alternative, then for alternatives B and C.

METHODS FOR ASSESSING IMPACTS

Impact analyses and conclusions are based on review of existing literature and studies, information from Lake Mead NRA staff; professional judgments and insights of other agencies and experts; and input from interested American Indian tribes and the public. Definitions used to evaluate the context, intensity, and duration of impacts, as well as cumulative impacts, are discussed below. Environmental consequences are evaluated based on the implementation of mitigation measures outlined in the “Alternatives” section of this document.

Context is the setting within which impacts are analyzed such as the affected region, society as a whole, the affected interests, and/or a locality. In this environmental assessment, the intensity of impacts are evaluated within a local (Willow Beach area) context, while the intensity of cumulative impacts are evaluated in a regional context.

The *Duration* of an impact is the time period for which the impacts are evident and are expressed in the short term or in the long term. A short-term impact would be temporary in duration and would be associated with the construction of the new wastewater treatment facility, as well as the period of site restoration. Depending on the resource, impacts may last as long as construction takes place, or a single year or growing season, or longer; impact duration for each resource is unique to that resource. Impact duration for each resource is presented in association with impact intensities in the “Methodologies” section below.

Intensity is the degree to which a resource would be beneficially or adversely affected. The criteria that were used to rate the intensity of the impacts for each resource topic are presented later in this section under each topic heading.

Impact type can be beneficial or adverse. Beneficial impacts would improve resource conditions while adverse impacts would deplete or negatively alter resources.

METHODOLOGIES

The methods used to conduct the environmental impact analyses are presented in this section. The methods are described only for those resource topics carried forward in the environmental consequences discussion and are presented in the following order:

Natural Resources:	Biotic Communities, Threatened and Endangered Species and Species of Special Concern, Floodplains and Water Quality, Soils, and Air Quality
Cultural Resources:	Ethnographic Resources
Social Resources:	Visitor Use and Experience and Health and Safety

Biotic Communities

The biotic communities impact topic includes vegetation and wildlife. The National Park Service Organic Act, which directs parks to conserve wildlife unimpaired for future generations, is interpreted by the agency to mean that native animal life should be protected and perpetuated as part of the park's natural ecosystem. Natural processes are relied on to control populations of native species to the greatest extent possible; otherwise, they are protected from harvest, harassment, or harm by human activities. According to *NPS Management Policies 2001*, the restoration of native plant and animal species is a high priority (sec. 4.1). Management goals for plants and animals include maintaining components and processes of naturally evolving park ecosystems, including natural abundance, diversity, and the ecological integrity of plants and animals.

All available information on wildlife, vegetation, and vegetative communities potentially impacted in the project area was compiled. Where possible, map locations of sensitive vegetation species, populations, and communities were identified and avoided. The thresholds of change for the intensity of an impact are defined as follows.

Impact Intensity	Intensity Description
Negligible	No native vegetation or wildlife would be affected or some individual native plants or wildlife could be affected as a result of the alternative, but there would be no effect on native species populations. The effects would be short term and well within natural fluctuations.
Minor	Impacts would be detectable, but they would not be expected to be outside the natural range of variability and would not be expected to have any long-term effects on native species, their habitats, or the natural processes sustaining them. Mitigation measures, if needed to offset adverse effects, would be simple and successful.
Moderate	Impacts on native species, their habitats, or the natural processes sustaining them, would be detectable, and they could be outside the natural range of variability for short periods of time. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.
Major	Impacts on native species, their habitats, or the natural processes sustaining them, would be detectable, and they would be expected to be outside the natural range of variability for long periods of time or be permanent. Key ecosystem processes might be disrupted in the long term or permanently. Loss of habitat might affect the viability of at least some native wildlife species. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.

Impacts to wildlife species would be considered short term if the impacts last less than one year and long term if the impacts last more than one year. Impacts to plant species would be considered short term if the impacts lasted less than three years and long term if the impacts lasted more than three years.

Threatened and Endangered Species or Species of Special Concern

The Endangered Species Act (16 USC 1531 *et seq.*) mandates that all federal agencies consider the potential effects of their actions on species listed as threatened or endangered. If the National Park Service determines that an action may adversely affect a federally listed species, consultation with the U.S. Fish and Wildlife Service is required to ensure that the action will not jeopardize the species' continued existence or result in the destruction or adverse modification of critical habitat. *NPS Management Policies 2001* state that potential effects of agency actions will also be considered on state or locally listed species. The National Park Service is required to control access to critical habitat of such species, and to perpetuate the natural distribution and abundance of these species and the ecosystems upon which they depend. Information on possible threatened, endangered, candidate species and species of special concern was gathered from species lists made available through the U.S. Fish and Wildlife Service. The thresholds of change for the intensity of an impact are defined as follows.

Impact Intensity	Intensity Description
Negligible	The action could result in a change to a population or individuals of a species or designated critical habitat, but the change would be so small that it would not be of any measurable or perceptible consequence.
Minor	The action could result in a change to a population or individuals of a species or designated critical habitat. The change would be measurable but small and localized and of little consequence.
Moderate	The action would result in some change to a population or individuals of a species or designated critical habitat. The change would be measurable and of consequence.
Major	The action would result in a noticeable change to a population or individuals of a species or resource or designated critical habitat.

Impacts to threatened and endangered wildlife species would be considered short term if the impacts last less than one year and long term if the impacts last more than one year. Impacts to threatened and endangered plant species would be considered short term if the impacts lasted less than three years and long term if the impacts lasted more than three years.

Floodplains and Water Quality

Floodplains are defined by the National Park Service Floodplain Management Guideline (1993) as "the lowland and relatively flat areas adjoining inland and coastal waters, including flood-prone areas of offshore islands, and including, at a minimum, that area subject to temporary inundation by a regulatory flood." The National Park Service has adopted the policy of preserving floodplain values and minimizing potentially hazardous conditions associated

with flooding (*NPS Floodplain Management Guideline*, July 1, 1993). The planning team based the impact analysis and the conclusions for possible impacts to floodplains on the onsite inspection of known and potential 100- and 500-year floodplains within the park, review of existing literature and studies, information provided by experts in the National Park Service and other agencies, and Lake Mead National Recreation Area staff insights and professional judgment. Where possible, map locations of 100- and 500-year floodplains were compared with locations of proposed developments and modifications of existing facilities. Predictions about short- and long-term site impacts were based on previous studies of impacts to 100- and 500-year floodplains from similar projects and recent scientific data. The thresholds of change for the intensity of an impact are defined as follows:

The *NPS Management Policies 2001* state that the Park Service will “take all necessary actions to maintain or restore the quality of surface waters and ground waters within the parks consistent with the Clean Water Act and all other applicable federal, state, and local laws and regulations” (sec. 4.6.3).

A water quality standard defines the water quality goals of a waterbody by designating uses to be made of the water, by setting minimum criteria to protect the uses, and by preventing degradation of water quality through antidegradation provisions. The antidegradation policy is only one portion of a water quality standard. Part of this policy (40 CFR 131.12(a)(2)) strives to maintain water quality at existing levels if it is already better than the minimum criteria. Antidegradation should not be interpreted to mean that “no degradation” can or will occur, as even in the most pristine waters, degradation may be allowed for certain pollutants as long as it is temporary and short term.

Other considerations in assessing the magnitude of water quality impacts is the effect on those resources dependent on a certain quality or condition of water. Sensitive aquatic organisms, submerged aquatic vegetation, riparian areas, and wetlands are affected by changes in water quality from direct and indirect sources.

Given the above water quality and floodplain issues and methodology and assumptions, the following impact thresholds were established in order to describe the relative changes in water quality and floodplains under the management alternatives.

Impact Intensity	Intensity Description
Negligible	<p>There would be no change in the ability of a floodplain to convey floodwaters, or its values and functions. Project would not contribute to the flood.</p> <p>Impacts to water quality are chemical, physical, or biological effects that would not be detectable, would be well below water quality standards or criteria, and would be within historical or desired water quality conditions.</p>
Minor	<p>Changes in the ability of a floodplain to convey floodwaters, or its values and functions, would be measurable and local, although the changes would be only just measurable. Project would not contribute to the flood. No mitigation would be needed.</p> <p>Impacts to water quality (chemical, physical, or biological effects) would be detectable, but would be well below water quality standards or criteria and within historical or desired water quality conditions.</p>

Moderate	<p>Changes in the ability of a floodplain to convey floodwaters, or its values and functions, would be measurable and local. Project could contribute to the flood. The impact could be mitigated by modification of proposed facilities in floodplains.</p> <p>Impacts to water quality (chemical, physical, or biological effects) would be detectable but would be at or below water quality standards or criteria; however, historical baseline or desired water quality conditions would be altered on a short-term basis.</p>
Major	<p>Changes in the ability of a floodplain to convey floodwaters, or its values and functions, would be measurable and widespread. Project would contribute to the flood. The impact could not be mitigated by modification of proposed facilities in floodplains.</p> <p>Impacts to water quality (chemical, physical, or biological effects) would be detectable and would be frequently altered from the historical baseline or desired water quality conditions; and/or chemical, physical, or biological water quality standards or criteria would be slightly and singularly exceeded on a short-term basis.</p>

Floodplain and water quality impacts would be considered short term if the impacts lasted less than one year. Floodplain and water quality impacts would be considered long term if the impacts lasted more than one year.

Soils

All available information on soils potentially impacted should the preferred alternative be implemented was compiled. Where possible, map locations of sensitive soils were compared with locations of proposed developments and modifications of existing facilities. Predictions about short- and long-term site impacts were based on previous projects with similar soils and recent studies. The thresholds of change for the intensity of an impact are defined as follows:

Impact Intensity	Intensity Description
Negligible	Soils would not be affected or the effects to soils would be below or at the lower levels of detection. Any effects to soils would be slight.
Minor	The effects to soils would be detectable. Effects to soil area would be small. Mitigation may be needed to offset adverse effects and would be relatively simple to implement and likely be successful.
Moderate	The effect on soil would be readily apparent and result in a change to the soil character over a relatively wide area. Mitigation measures would be necessary to offset adverse effects and likely be successful.
Major	The effect on soil would be readily apparent and substantially change the character of the soils over a large area in and out of the park. Mitigation measures to offset adverse effects would be needed, extensive, and their success could not be guaranteed.

Soils impacts would be considered short term if the soils recovered in less than three years. Soil impacts would be considered long term if the soils take more than three years to recover.

Air Quality

The 1963 Clean Air Act, as amended (42 USC 7401 *et seq.*), requires land managers to protect air quality. Section 118 of the Clean Air Act requires parks to meet all federal, state, and local air pollution standards. *NPS Management Policies 2001* address the need to analyze potential impacts to air quality during park planning. Under the Clean Air Act, Lake Mead NRA is designated as a Class II area. Impacts to air quality would be measured in terms of the following impact thresholds.

Negligible	An action that could affect air quality, but the change would be so small and short term that it would not be of any measurable or perceptible consequence.
Minor	An action that could affect air quality, but the change would be slight and localized with few measurable consequences. Mitigation measures would be relatively simple to implement.
Moderate	An action that would result in readily apparent changes to air quality, with measurable consequences. Mitigation measures would require project changes or specialized equipment.
Major	A severely adverse and long-term effect to air quality would result.

Short-term impacts to air quality would occur only during the construction activities. Long-term impacts to air quality would continue after the construction is completed.

Ethnographic Resources

Certain important questions about human culture and history can only be answered by gathering information about the cultural content and context of cultural resources. Questions about contemporary peoples or groups, their identity, and heritage have the potential to be addressed through ethnographic resources. As defined by the National Park Service Directors Order 28, an ethnographic resource is a site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it. Some such specific places of traditional cultural use may be eligible for inclusion in the NRHP if they meet national register criteria for traditional cultural properties.

Impact Intensity	Impact Type	Intensity Description
Negligible	Adverse or Beneficial	Impact(s) would be barely perceptible and would neither alter resource conditions, such as traditional access or site preservation, nor alter the relationship between the resource and the affiliated group's body of practices and beliefs. For purposes of section 106, the determination of effect on traditional cultural properties would be <i>no adverse effect</i> .
Minor	Adverse	Impact(s) would be slight but noticeable and would neither appreciably alter resource conditions, such as traditional access or site preservation, nor alter the relationship between the resource and the affiliated group's body of practices and beliefs. For purposes of section 106, the determination of effect on traditional cultural properties would be <i>no adverse effect</i> .

	Beneficial	Would allow access to and/or accommodate a group's traditional practices or beliefs. For purposes of section 106, the determination of effect on traditional cultural properties would be <i>no adverse effect</i> .
Moderate	Adverse	Impact(s) would be apparent and would alter resource conditions. Something would interfere with traditional access, site preservation, or the relationship between the resource and the affiliated group's practices and beliefs, even though the group's practices and beliefs would survive. For purposes of section 106, the determination of effect on traditional cultural properties would be <i>adverse effect</i> .
	Beneficial	Would facilitate traditional access and/or accommodate a group's practices or beliefs. For purposes of section 106, the determination of effect on traditional cultural properties would be <i>no adverse effect</i> .
Major	Adverse	Impact(s) would alter resource conditions. Something would block or greatly affect traditional access, site preservation, or the relationship between the resource and the affiliated group's body of practices and beliefs, to the extent that the survival of a group's practices and/or beliefs would be jeopardized. For purposes of section 106, the determination of effect on traditional cultural properties would be <i>adverse effect</i> .
	Beneficial	Would encourage traditional access and/or accommodate a group's practices or beliefs. For purposes of section 106, the determination of effect on traditional cultural properties would be <i>no adverse effect</i> .

Short-term effects are those lasting less than one year. Long-term effects are those lasting greater than one year or are permanent.

Visitor Use and Experience

NPS Management Policies 2001 state that the enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all national parks and that the National Park Service is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks.

Part of the purpose of Lake Mead NRA is to offer opportunities for recreation, education, inspiration, and enjoyment. Consequently, one of the park's management goals is to ensure that visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities.

Public scoping input and observation of visitation patterns, combined with assessment of what is available to visitors under current management, were used to estimate the effects of the actions in the various alternatives in this document. The impact on the ability of the visitor to experience a full range of Lake Mead NRA resources was analyzed by examining resources and objectives presented in the park significance statement. The potential for change in visitor use and experience proposed by the alternatives was evaluated by determining whether or how these projected changes would affect the desired visitor experience and to what degree and for how long.

Impact Intensity	Intensity Description
Negligible	Visitors would not be affected or changes in visitor use and/or experience would be below or at the level of detection. Any effects would be short term. The visitor would not likely be aware of the effects associated with the alternative.
Minor	Changes in visitor use and/or experience would be detectable, although the changes would be slight and likely short term. The visitor would be aware of the effects associated with the alternative, but the effects would be slight.
Moderate	Changes in visitor use and/or experience would be readily apparent and likely long term. The visitor would be aware of the effects associated with the alternative and would likely be able to express an opinion about the changes.
Major	Changes in visitor use and/or experience would be readily apparent, severely adverse, or exceptionally beneficial, and have important long-term consequences. The visitor would be aware of the effects associated with the alternative and would likely express a strong opinion about the changes.

Short-term impacts to visitor use and experience would occur only during the construction activities. Long-term impacts to visitor use and experience would continue after the construction is completed.

Health and Safety

The impact assessment for health and safety focused on the number of potential individuals impacted and the severity of the impact.

The thresholds of change for the intensity of an impact are defined as follows:

Impact Intensity	Intensity Description
Negligible	Public health and safety would not be affected, or the effects would be at the lowest levels of detection and would not have an appreciable effect on the public health or safety.
Minor	The effect would be detectable but would not have an appreciable effect on public health and safety. If mitigation were needed, it would be relatively simple and would likely be successful.
Moderate	The effects would be readily apparent and result in substantial, noticeable effects to public health and safety on a local scale. Mitigation measures would probably be necessary and would likely be successful.
Major	The effects would be readily apparent and result in substantial, noticeable effects to public health and safety on a regional scale. Extensive mitigation measures would be needed, and success would not be guaranteed.

Short-term public health and safety effects are those lasting for the duration of the project. Long-term public health and safety effects are those lasting longer than the duration of the project.

Cumulative Impacts

Council on Environmental Quality regulations, which implement NEPA, require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions” (40 CFR 1508.7). Cumulative impacts are considered for both the no-action and other alternatives.

Cumulative impacts were determined by combining the impacts of the alternatives with other past, present, or reasonably foreseeable actions. It was, therefore, necessary to identify major past, ongoing, or reasonably foreseeable future actions affecting Lake Mead NRA.

Actions included in the cumulative impact scenario for this environmental assessment include:

- Boat launch closures that result from the reduction of water levels in Lake Mead and Lake Mohave.
- Small road projects within Lake Mead NRA, including the rehabilitation of North Shore Road and Callville Bay Road. These projects involve widening the roads, improving poor pavement conditions, rehabilitating deteriorated and inadequate drainage facilities (i.e., culverts), and realignment to reduce traffic accidents.
- Implementation of the *Willow Beach Development Concept Plan*, which calls for the construction of a new visitor services building and residences in the developed area, and a maintenance facility and native plant nursery in Willow Beach Wash.
- Changes in land use as a response to population growth. In the Las Vegas metropolitan area, urban development, recreation, and grazing have increased as more people have settled here. This includes increases in power plant, vehicle, and urban industrial emissions.
- The desert tortoise incidental take permit issued to Clark County and the cities of Las Vegas, North Las Vegas, Henderson, and Boulder City. Issued by the U.S. Fish and Wildlife Service pursuant to section 10(a)(1)(b) of the Endangered Species Act of 1973, as amended, authorizes the incidental take of desert tortoise and other listed species on non-federal land within the permit boundaries.
- The Hoover Dam Bypass Project is intended to reduce congestion on U.S. 93 by construction of a four-lane highway between Milepost 2.2 in Clark County, Nevada, and Milepost 1.7 in Mohave County, Arizona. This involves building a new steel or concrete four-lane bridge over the Colorado River near Hoover Dam, four-lane approaches, and the approach bridges and tunnels needed for the approximately 3.5-mile-long project (NPS 2001a).
- The *Lake Mead NRA Lake Management Plan*. This plan focuses on protecting the natural environment while supporting the recreational interests of park visitors. The

plan calls for managing 5% of the waters in Lake Mead and Lake Mohave for semi-primitive or primitive uses, yet providing for an increase in boating activities. All two-stroke, carbureted engines would be prohibited after 2012. Specific actions to address personal watercraft use, shoreline, and boating conflicts, and litter and sanitation issues are also included (NPS 20002a).

IMPAIRMENT OF PARK RESOURCES AND VALUES

In addition to determining the environmental consequences of the proposed action and alternatives, the 2001 *NPS Management Policies* and Director's Order – 12: *Conservation Planning, Environmental Impact Analysis, and Decision-making*, require analysis of potential effects to determine if actions would impair Lake Mead NRA resources. The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. National Park Service managers must seek ways to avoid, or minimize to the greatest degree practicable, adversely impacting Lake Mead NRA resources and values. Congress has given National Park Service managers discretion, however, to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, so long as the impact does not constitute impairment of the affected resources and values.

The prohibited impairment is an impact that would, in the professional judgment of the responsible National Park Service manager, harm the integrity of environmental assessment resources or values, including opportunities that would otherwise be present for the enjoyment of those resources or values. An impact would be more likely to constitute an impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific Lake Mead NRA purposes identified in the establishing legislation or proclamation of Lake Mead NRA
- key to the natural or cultural integrity of Lake Mead NRA or to opportunities for enjoyment of Lake Mead NRA
- identified as a goal in Lake Mead NRA's *General Management Plan* or other relevant National Park Service planning documents

Impairment determinations are made in the "Conclusion" sections of natural resource and cultural resource impact topics in this document. Impairment statements are not required for visitor use and experience or human health and safety impact topics.

IMPACTS TO CULTURAL RESOURCES AND SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

In this environmental assessment impacts to cultural resources are described in terms of type, context, duration, and intensity, which is consistent with the regulations of the Council on Environmental Quality that implement NEPA. These impact analyses are intended, however, to comply with the requirements of both NEPA and section 106 of the National Historic

Preservation Act. In accordance with the Advisory Council on Historic Preservation's regulations implementing section 106 of the National Historic Preservation Act (36 CFR Part 800, *Protection of Historic Properties*), impacts to cultural resources were also identified and evaluated by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that are either listed in or eligible to be listed in the NRHP; (3) applying the criteria of adverse effect to affected, NRHP eligible or listed cultural resources; and (4) considering ways to avoid, minimize or mitigate adverse effects.

Under the Advisory Council's regulations a determination of either *adverse effect* or *no adverse effect* must also be made for affected NRHP listed or eligible cultural resources. An *adverse effect* occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the NRHP, e.g., diminishing the integrity (or the extent to which a resource retains its historic appearance) of its location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by the alternatives that would occur later in time, be farther removed in distance or be cumulative (36 CFR 800.5, *Assessment of Adverse Effects*). A determination of *no adverse effect* means there is an effect, but the effect would not diminish the characteristics of the cultural resource that qualify it for inclusion in the NRHP.

Council on Environmental Quality regulations and the National Park Service's *Conservation Planning, Environmental Impact Analysis and Decision-making* (Director's Order – 12) also call for a discussion of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, e.g., reducing the intensity of an impact from major to moderate or minor. Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect as defined by section 106 is similarly reduced. Cultural resources are non-renewable resources and adverse effects generally consume, diminish, or destroy the original historic materials or form, resulting in a loss in the integrity of the resource that can never be recovered. Therefore, although actions determined to have an adverse effect under section 106 may be mitigated, the effect remains adverse.

A section 106 summary is included in the impact analysis sections. The section 106 summary is an assessment of the effect of the undertaking (implementation of the alternative) on NRHP eligible or listed cultural resources only. Based upon the criterion of effect and criteria of adverse effect found in the Advisory Council's regulations.

ALTERNATIVE A: NO-ACTION ALTERNATIVE

Biotic Communities

Under the no-action alternative, the potential discharge of sewage effluent to Lake Mohave from the deteriorating wastewater treatment facility (see the "Floodplains and Water Quality" discussion for a detailed description of the potential discharges) could degrade habitat for fish and amphibians that use Lake Mohave. However, given the dilution factor in a lake the size of Lake Mohave, short-term, negligible, adverse impacts to the fish species that use the aquatic

habitat provided by the lake, would be anticipated. The degree of impact would depend on the severity of the discharge (i.e., should a large failure occur, the impact intensity would be greater). Short-term, negligible, adverse impacts could also occur to amphibians that use the aquatic and shoreline habitat of Lake Mohave. This, in turn, could have short-term, negligible, adverse impacts on species of birds that eat the fish and amphibians.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions with the potential to affect biotic communities include the rehabilitation of Northshore and Callville Bay Roads; implementation of the *Willow Beach Development Concept Plan*; visitor use and the operation and maintenance of Lake Mead NRA facilities; changes in land use in response to population growth; the *Hoover Dam Bypass Project*; and implementation of the *Lake Management Plan*. All of these would have short- and long-term, minor to moderate, adverse impacts on biotic communities by increasing human population and use, temporarily or permanently displacing wildlife, and temporarily or permanently disturbing vegetation. However, implementation of the *Lake Management Plan* would have some long-term, beneficial effect as a result of the elimination of pollutant sources, as well as the removal of non-native saltcedar (*tamarisk* sp.) along the lake shorelines. The no-action alternative would have negligible adverse contributions to the cumulative impacts in the short and long term. The cumulative effects of these past, present, and reasonably foreseeable future actions, in conjunction with the no-action alternative, would have short- and long-term, minor to moderate, adverse impacts on biotic communities.

Conclusion. Depending on the severity of a potential sewage discharge, the following effects would be anticipated for the no-action alternative from degradation (due to changes in water quality) of aquatic and shoreline habitats:

- Short-term, negligible, adverse impacts to the fish species that use the aquatic habitat provided by the lake.
- Short-term, negligible, adverse impacts to species of amphibians with the potential to use the aquatic and shoreline habitat.
- Short-term, negligible, adverse impacts to species of birds that rely on the fish and amphibians supported by the lake.

The cumulative effects of past, present, and reasonably foreseeable future actions in and surrounding Lake Mead NRA, in combination with the no-action alternative, are anticipated to have short- and long-term, minor to moderate, adverse impacts on biotic communities.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of biotic communities.

Threatened and Endangered Species and Species of Concern

As discussed for “Biotic Communities” and “Floodplains and Water Quality,” the leaking and deteriorating wastewater system at Willow Beach could introduce both sewage and sediment to Lake Mohave. However, given the dilution factor of a lake this size, the impacts to the water quality of Lake Mohave are anticipated to be minor. This slight degradation in water quality would affect, but is not likely to adversely affect, the razorback sucker, bonytail chub, or the designated critical habitat for these species in Lake Mohave.

Desert tortoises have not been sighted in the Willow Beach area since 1990 and, although the bald eagle could be transient in this area, the no-action alternative would not impact these species.

Cumulative Impacts. Human activities such as construction and maintenance of roads, buildings, recreational facilities, and visitor facilities, within and outside of Lake Mead NRA, have disturbed biotic communities (including aquatic resources) historically by altering habitat and have the potential to do so in the future. Visitor use and operation/maintenance of facilities at Lake Mead NRA contribute sediments and pollutants to Lake Mead and Lake Mohave. Other National Park Service plans and projects (e.g., the *Lake Management Plan* 2002a, and boat ramp improvements) are likely to have both beneficial and adverse impacts to water quality. These effects on aquatic habitat have the potential to affect the razorback sucker and bonytail chub in Lake Mohave. The cumulative impacts to these species from these activities are anticipated to be short- and long-term, negligible to minor, and adverse. The no-action alternative, when viewed in the context of other regional impacts to aquatic habitat and water quality, would contribute negligibly to the cumulative effects on the razorback sucker and bonytail chub. The overall cumulative impacts to the razorback sucker and bonytail chub, including the no-action alternative impacts, would be short and long term, negligible to minor, and adverse.

There would be no impacts to the desert tortoise and bald eagle from the no-action alternative; therefore, there would be no cumulative impacts.

Conclusion. There would be no impacts to threatened and endangered species or species of concern from the no-action alternative. Past, present, and reasonably foreseeable future actions, when considered with the no-action alternative, are anticipated to have short-term, negligible to minor, adverse impacts on the razorback sucker and bonytail chub. Because the no-action alternative would have no impact to the desert tortoise and bald eagle, there would be no cumulative effects to these species.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park’s establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park’s *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of threatened and endangered species or species of concern.

Floodplains and Water Quality

Under the no-action alternative, there is concern that the flood protection berm has been damaged and eroded over the 25 years the wastewater treatment facility has been in operation. Should a partial or total failure of this berm occur, it could alter the current flood flows in Willow Beach Wash. This could have a short-term (until the berm was restored), beneficial effect on the floodplain of Willow Beach Wash, restoring natural morphology and processes.

Sewage collection and transmission lines would continue to leak, while manholes, lift stations, and lagoon liners would continue to deteriorate under the no-action alternative. This could potentially contaminate groundwater in the Willow Beach area, although substantial leaks would be noticed and repaired. The partial or total failure of the flood protection berm could also cause sewage effluent to be transported downstream in Willow Beach Wash. As it passes over the surface of the wash, some of this effluent could seep below ground and eventually into the groundwater. These discharges of effluent could have short- and long-term, minor to moderate, adverse impacts on water quality of the infiltrated lake water, depending on the severity of the leaks/deterioration.

Leaking and deteriorating wastewater treatment components could also result in a spill of sewage in the Willow Beach area. This includes the developed area, where a spill could directly discharge to Lake Mohave, or where effluent could be carried by water flows over the impervious parking lot surface and into the lake. An effluent spill in Willow Beach Wash could result in the transport of contaminants downstream and discharge to Lake Mohave during a rain event. Because the groundwater in the Willow Beach area infiltrates Lake Mohave, contamination of the infiltrated lake water could potentially contaminate surface waters as well. The partial or total failure of the flood protection berm during a rain event could also cause sewage and a large load of sediment (i.e., the materials used to build the berm) to be transported downstream to Willow Beach Wash. The discharge of sediment and effluent to Lake Mohave could have short- and long-term, minor, adverse impacts on the water quality of the lake, given the dilution factor in a lake this size.

Cumulative Impacts. The Northshore and Callville Bay Roads projects, as well as the implementation of the *Willow Beach Development Concept Plan* propose activities (e.g., road rehabilitation, culvert work, and facility development) that would have short- and long-term, minor, adverse impacts on floodplains. Visitor use and operation/maintenance of facilities in Lake Mead NRA contribute sediments and pollutants to Lake Mead and Lake Mohave. Other National Park Service plans and projects (e.g., the *Lake Management Plan 2002a*, and boat ramp improvements) are likely to have beneficial and adverse impacts on water quality. These cumulative actions would have short- and long-term, negligible to minor, adverse impacts on water quality. However, the no-action alternative, when viewed in the context of other regional impacts, would contribute negligibly to the cumulative effects on floodplains and water quality. The cumulative effects of the past, present, and reasonably foreseeable future actions, in conjunction with the no-action alternative, would have short- and long-term, negligible to minor, adverse impacts on floodplains and water quality.

Conclusion. Short-term, beneficial effects on the floodplain of Willow Beach Wash could result from the partial or total failure of the flood protection berm by restoring natural

morphology and processes. Potential discharges of effluent could have short- and long-term, minor to moderate, adverse impacts on water quality of the infiltrated lake water underlying the Willow Beach area, depending on the severity of the leaks and deterioration. The discharge of sediment and effluent to Lake Mohave could have short- and long-term, minor, adverse impacts on the water quality of the lake. The cumulative effects of the past, present, and reasonably foreseeable future actions, in conjunction with the no-action alternative, would have short- and long-term, negligible to minor, adverse impacts on floodplains and water quality.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of floodplains or water quality.

Soils

There would be no new impacts to soils as a result of the no-action alternative.

Cumulative Impacts. Because the no-action alternative would not impact soils, there would be no cumulative impacts.

Conclusion. There would be no new impacts to soils as a result of the no-action alternative. Because there are no new impacts to soils, there would be no cumulative impacts from the no-action alternative.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of soils.

Air Quality

There would be no new impacts to air quality as a result of the no-action alternative.

Cumulative Impacts. Because there are no new impacts to air quality as a result of the no-action alternative, there would be no cumulative impacts.

Conclusion. There would be no new impacts to air quality as a result of the no-action alternative. Because there are no new impacts to air quality, there would be no cumulative impacts.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of air quality.

Ethnographic Resources

There would be no known impacts to ethnographic resources as a result of the no-action alternative.

Cumulative Impacts. Because there would be no known impacts to ethnographic resources from the no-action alternative, there would be no cumulative impacts.

Conclusion. There would be no known impacts to ethnographic resources as a result of the no-action alternative. Because there would be no known impacts to ethnographic resources from the no-action alternative, there would be no cumulative impacts.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of ethnographic resources.

Visitor Use and Experience

Under the no-action alternative, deteriorating Willow Beach wastewater treatment facilities would remain in use with required maintenance to keep the system operational. This alternative would have little impact on visitor use and experience, unless maintenance activities required temporary closure of the restroom facilities to visitor use. In the event of a longer closure, portable restroom facilities would be used to mitigate visitor use impacts. The impact of temporary closure would be negligible to minor, short term, and adverse.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions affecting visitor use and experience include the closure of boat launch lanes or total closure of boat launches elsewhere in Lake Mead NRA due to low water levels. These closures have the potential to cause traffic congestion, crowded conditions at those launches that remain open (including those on Lake Mohave at Willow Beach), and longer waits for launch facilities. Other construction activities (e.g., the Northshore and Callville Bay Roads projects, as well as the Hoover Dam Bypass Project), as well as the *Willow Beach Development Concept Plan* and the *Lake Management Plan* at Lake Mead NRA could cause traffic congestion and longer waits for launch facilities, as well as noise and visual intrusions on the landscape (e.g., heavy equipment). The *Willow Beach Development Concept Plan* would also have long-term, beneficial effects as a result of the construction of a new visitor services center. The *Lake Management Plan* would

have a long-term, beneficial effect for visitors who prefer non-motorized, water-related experiences, although there would also be a long-term, adverse impact on visitors who do enjoy motorized water sports. The cumulative effects of past, present, and reasonably foreseeable future actions would have short-term, minor to moderate, adverse impacts on visitor use and experience, although some long-term beneficial effects could occur. There would be no impacts to visitor use and experience from the no-action alternative and, therefore, no cumulative effects, unless restrooms were temporarily closed due to maintenance needs for the existing wastewater treatment facility. Temporary closure would provide negligible contributions to the overall cumulative impacts. In this case, the cumulative effects to visitor use and experience, including the no-action alternative, would result in short-term, minor to moderate, adverse impacts.

Conclusion. The no-action alternative could result in no impacts unless restrooms were temporarily closed. There would be negligible to minor, short-term, adverse impacts on visitor use and experience if Willow Beach wastewater treatment facilities were temporarily closed. There would be no cumulative effects, unless restrooms were temporarily closed due to maintenance needs for the existing wastewater treatment facility. The cumulative effects of restroom closure in association with past, present, and reasonably foreseeable future actions would have short-term, minor to moderate, adverse impacts on visitor use and experience.

Health and Safety

Leaking and deteriorating wastewater treatment components have the potential to introduce sewage effluent into the infiltrated lake water underlying the Willow Beach area. Because this infiltrated lake water is the water source for visitor and National Park Service facilities at Willow Beach, contamination could have short-term, negligible, adverse impacts on health and safety. Impacts would be temporary, as the National Park Service would likely stop drawing water from this source until it was deemed suitable for human consumption.

The risks to Lake Mead NRA staff responsible for operating and maintaining a wastewater treatment facility include entering confined spaces (e.g., manholes for accessing the system), exposure to microbes, and at Willow Beach, working in an area prone to flash flooding. If maintenance work is conducted in July, August, and September, there is an increased risk of flash flooding. These activities could have short- and long-term, negligible to minor, adverse impacts on the safety of Willow Beach staff and contractors.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions that could affect health and safety include the construction activities that would provide introduction of sediment and other pollutants into Lake Mead, which serves recreationists and as a water source for millions of people. Other projects that require work in situations that require confined space entries, or in areas prone to flash flooding (e.g., Callville Bay Road and Northshore Road rehabilitation) would also contribute to the cumulative effects on health and safety. The cumulative impacts of these actions would have short- and long-term, minor, adverse impacts on health and safety. The no-action alternative, when viewed in the context of other regional impacts to water quality, as well as other construction projects in Lake Mead NRA, would provide negligible contributions to the cumulative effects on health and safety.

Overall, cumulative impacts of past, present, and reasonably foreseeable future activities, in combination with the no-action alternative, would be short and long term, minor, and adverse.

Conclusion. The potential contamination of groundwater in the Willow Beach area could have short-term, negligible, adverse impacts on health and safety. Impacts would be temporary, as the National Park Service would likely stop drawing water from this source until it was deemed suitable for human consumption. Activities involving confined space entries, exposure to microbes, and work in a flash flood zone would have short- and long-term, negligible to minor, adverse impacts on the safety of Lake Mead NRA Willow Beach staff. Cumulative effects of past, present, and reasonably foreseeable actions, when considered with the no-action alternative, would have short- and long-term, minor, adverse impacts on health and safety.

ALTERNATIVE B: PREFERRED ALTERNATIVE

Biotic Communities

Under the preferred alternative, replacement of the leaking and deteriorating wastewater treatment system at Willow Beach would eliminate existing impacts to wildlife (e.g., fish, amphibians, and birds) associated with potential discharges of sewage effluent to Lake Mohave, through groundwater infiltration or otherwise, under the no-action alternative. This would have a short- and long-term, beneficial effect on biotic communities.

The installation of six septic tanks, duplex lift stations, and a central collection tank in the Willow Beach developed area would generally disturb paved surface areas that do not support vegetation and are of no habitat value to wildlife.

The new force main pipeline would be installed adjacent to the existing line, underneath a new access road. The majority of the disturbance along the 3,900-foot linear corridor required for this force main and access road would be within Willow Beach Wash. However, the effects would be predominantly in areas previously disturbed for construction of the existing force main and access road, and areas subject to periodic flooding, reducing the level of impact of this activity on vegetation. There would be some effects to previously undisturbed vegetation in areas that would be regraded to eliminate overhangs on the north side of the wash. Construction of the recirculating sand filter, subsurface disposal trenches, and associated control buildings, would require clearing approximately 17,975-square feet (0.41 acre) of desert wash vegetation. Associated soil disturbance increases the potential for non-native species to invade the area of disturbance and alter the natural ecological community. The mitigation measures identified for the preferred alternative, including washing equipment, selective positioning for equipment staging, defining construction zones and perimeters in the field, and saving/storing desert soil (and the soil seed bank) for restoration and revegetation of areas to be reclaimed would further reduce these impacts (refer to “Mitigation Measures for the Preferred Alternative” of the “Alternatives” section for a detailed discussion). As a result of implementing the preferred alternative, including mitigation measures, long-term, negligible to moderate, adverse impacts to desert wash plant communities would be anticipated.

During construction, some wildlife, particularly small mammals, reptiles, and amphibians, would be temporarily displaced. Some individuals may be killed outright or dispersed outside the construction limits, making them susceptible to predation or competitive stress. However, following completion of the project, wildlife would again reoccupy portions of the project area. The potential for sedimentation and erosion during construction (see the “Floodplains and Water Quality” section for a detailed discussion) could also contribute to turbidity (cloudiness) in Lake Mohave. If severe, turbidity can reduce light penetration and visibility, affect aquatic organisms, and reduce the ability of predatory fish and birds to see their prey. Therefore, the preferred alternative is anticipated to have short-term (during construction activities), negligible to minor, adverse impacts on wildlife.

Cumulative Impacts. The cumulative effects of past, present, and reasonably foreseeable future actions under the preferred alternative would be the same as described for biotic communities under the no-action alternative. The past, present, and reasonably foreseeable future actions would have short- and long-term, minor to moderate, adverse impacts on biotic communities. In the short term, the preferred alternative would contribute negligibly to these cumulative effects. However, long-term beneficial effects to biotic communities would be anticipated as a result of implementing the *Lake Management Plan* (from the elimination of pollutant sources and non-native vegetation) as well as the preferred alternative (from eliminating the threat of sewage effluent discharge to infiltrated lake water at Willow Beach). These beneficial effects, however, contribute negligibly to long-term impacts on biotic communities. Therefore, past, present, and reasonably foreseeable future projects, in combination with the preferred alternative, are anticipated to have short- and long-term, minor to moderate, adverse impacts on biotic communities.

Conclusion. The preferred alternative is anticipated to have short-term, negligible to moderate, adverse, as well as short- and long-term, beneficial, impacts on biotic communities. The cumulative effects of these activities, in combination with the preferred alternative, are anticipated to have short- and long-term, negligible to minor, adverse impacts on biotic communities.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park’s establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park’s *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of biotic communities.

Threatened and Endangered Species and Species of Concern

As discussed for “Biotic Communities” and “Floodplains and Water Quality,” the preferred alternative would eliminate existing impacts associated with potential discharges of sewage effluent to Lake Mohave. Eliminating this threat to infiltrated lake water and surface water quality at Willow Beach would have beneficial effects for the razorback sucker and bonytail chub, including the critical habitat in Lake Mohave for these species. Desert tortoises have not been sighted in the Willow Beach area since 1990, and although bald eagles could be transient in the area, no effects are expected to either of these species as a result of the preferred

alternative. Construction areas will be surveyed for desert tortoise prior to construction. If any sign of desert tortoise is found, Lake Mead NRA standard construction mitigation measures related to desert tortoise protection would be implemented.

Cumulative Impacts. The cumulative impacts under the preferred alternative would be the same as those described for the no-action alternative. See the discussion for the no-action alternative for details. Past, present, and reasonably foreseeable future actions related to urban development and visitor use at Lake Mead NRA would have short- and long-term, negligible to minor, adverse impacts on the razorback sucker and bonytail chub, even when considering the beneficial effects of the preferred alternative on these species. This beneficial effect contributes negligibly when viewed in the context of regional trends of habitat and water quality degradation that affects these species in Lake Mohave. The preferred alternative would not impact the desert tortoise or the bald eagle. Therefore, there would be no cumulative effects to desert tortoise and bald eagle from the preferred alternative.

Conclusion. Eliminating the threat of sewage effluent discharge to infiltrated lake water and surface water at Willow Beach would have beneficial effects for the razorback sucker and bonytail chub, including the critical habitat in Lake Mohave for these species. There would be no effect to the bald eagle and desert tortoise. Past, present, and reasonably foreseeable future actions, in conjunction with the preferred alternative, would have short- and long-term, negligible to moderate, adverse impacts to the razorback sucker and the bonytail chub. There would be no cumulative effects to desert tortoise and bald eagle from the preferred alternative.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of threatened and endangered species or species of concern.

Floodplains and Water Quality

Under the preferred alternative, the existing flood protection berm would be reinforced to eliminate concerns associated with current and future damage, including erosion. Construction of the new road and additional berms around the sewage disposal area would alter or divert existing flood flows. This could change the morphology and processes of the floodplain in Willow Beach Wash, which would have a long-term, minor, adverse impact on this resource.

Replacement of the leaking and deteriorating wastewater treatment system at Willow Beach would eliminate the impacts to surface and groundwater quality associated with potential discharges of sewage effluent under the no-action alternative. This would have a long-term, beneficial effect on water quality in the Willow Beach area.

Erosion and sedimentation associated with construction of a new wastewater treatment facility at Willow Beach, including demolition of the existing lagoons, are also important processes related to water quality impacts under this alternative. Erosion occurs when soil particles,

sand, small rocks, and other sediments are swept up and carried along by moving water, as from a rain event. Sediments in the project area would likely drop out downstream in Willow Beach Wash, or they would be carried into Lake Mohave. Some degree of erosion and sedimentation is normal, but the process accelerates when desert soils and gravel are loosened or otherwise disturbed by activities such as construction. The project area would, therefore, be most susceptible to erosion and sedimentation during construction; however, if possible, construction activities would be conducted outside of the monsoon season (July, August, and September) to avoid flash flood events that would exacerbate erosion and sedimentation.

Using best management practices for controlling nonpoint pollution during construction would help to control erosion and sedimentation during small storm events, as well as the potential for spills from construction equipment to introduce petrochemicals into the surface and groundwater of Willow Beach. However, if a major rainstorm were to occur during construction, sediments could be carried to Lake Mohave and contribute to turbidity (cloudiness) in the lake. Depending on the extent to which storm events could be avoided, increased erosion, sedimentation, and turbidity during construction could have short-term, negligible to minor, adverse impacts on water quality. Given the current potential for petrochemical spills from vehicles and boats in the Willow Beach area, and the implementation of best management practices, the use of construction equipment could have short-term, negligible, adverse impacts on water quality.

Cumulative Impacts. The cumulative effects of past, present, and reasonably foreseeable future actions under the preferred alternative would be the same as those discussed for floodplains and water quality under the no-action alternative. The impacts of these cumulative effects are anticipated to be short- and long-term, negligible to minor, and adverse. The preferred alternative would provide negligible contributions to the impacts of past, present, and reasonably foreseeable future actions and overall cumulative effects would be short- and long-term, negligible to minor and adverse.

Conclusion. Long-term, minor, adverse impacts to the morphology and processes of the floodplain in Willow Beach Wash would be anticipated from the construction of the new access road and a flood protection berm around the new sewage disposal area. A long-term, beneficial effect on water quality in the Willow Beach area would be expected from the replacement of the leaking and deteriorating wastewater treatment facility.

Depending on the extent to which storm events could be avoided, increased erosion, sedimentation, and turbidity during construction could have short-term, negligible to minor, adverse impacts on water quality. Given the current potential for petrochemical spills from vehicles and boats in the Willow Beach area, and the implementation of best management practices, the use of construction equipment could have short-term, negligible, adverse impacts on water quality.

The cumulative effects of the preferred alternative, in combination with other past, present, and reasonably foreseeable future events, would have short- and long-term, minor, adverse impacts.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes

identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of floodplains or water quality.

Soils

The disturbances in the Willow Beach developed area resulting from the installation of six septic tanks, duplex lift stations, and a central collection tank, would be within the existing paved parking area. There would be no new ground disturbance in this developed area and, therefore, no impacts to soils from installing these features of the preferred alternative.

As described for biotic communities above, the installation of a new force main and construction of an access road in Willow Beach Wash would cause disturbances along an approximately 3,000-foot linear corridor, in areas previously disturbed by construction of the existing force main and access road. There would be some disturbance to previously undisturbed soils in areas that would be regraded to eliminate overhangs on the north side of the wash. Construction of the recirculating sand filter, subsurface disposal trenches, and associated control buildings, would require disturbance to 0.41 acre of desert wash soils. However, some of these soils were previously disturbed during construction of the existing lagoons. Rehabilitation and revegetation efforts would reduce scarring and loss of soil through erosion. Natural soil processes would be restored in rehabilitated areas only over the very long term, as soil structure slowly returned to a more natural condition. Some trampling and compaction of soils by construction equipment and workers within the construction zone is expected. Local soil compaction would temporarily decrease permeability, alter soil moisture content, and diminish the water storage capacity of the generally xeric soils. Overall, the impacts to soils from the preferred alternative are expected to be long term, minor, and adverse.

Cumulative Impacts. The cumulative effects of past, present, and reasonably foreseeable future actions under the preferred alternative would be the same as those for soils under the no-action alternative. See the no-action alternative discussion for details. The impacts of these cumulative effects would be long-term, minor to moderate, and adverse. The preferred alternative would provide minor contributions to the impacts of past, present, and reasonably foreseeable future actions and the overall cumulative impacts would continue to be long-term, minor to moderate, and adverse.

Conclusion. Overall, the impacts to soils from construction activities of the preferred alternative are expected to be long term, negligible, and adverse. The cumulative impacts to soil would be long term, minor to moderate, and adverse.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of soils.

Air Quality

The preferred alternative would temporarily affect local air quality through increased dust and vehicle emissions. Hydrocarbons, nitrous oxide, and sulfur dioxide emissions would be largely dispersed by prevailing winds in the Willow Beach area. Dust created during construction would increase airborne particulates intermittently, but airborne dust is not expected to be appreciable. Mitigation measures such as sprinkling water to reduce dust and limiting the idling of construction equipment would be implemented, as appropriate. Impacts to air quality from dust and construction equipment emissions would be short term, negligible to minor, and adverse.

Cumulative Impacts. The cumulative effects of past, present, and reasonably foreseeable future actions under the preferred alternative would be the same as those for air quality under the no-action alternative. See the no-action alternative discussion for details. The preferred alternative would contribute short-term, negligible to minor, adverse impacts to air quality. The cumulative effects, in conjunction with the preferred alternative, would be short term, minor, and adverse.

Conclusion. Impacts to air quality from dust and construction equipment emissions under the preferred alternative would be short term, negligible to minor, and adverse. The preferred alternative, when considered in combination with the effects of past, present, and reasonably foreseeable future actions, would result in short-term, minor, adverse cumulative, effects.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of air quality.

Ethnographic Resources

As a result of consultation with American Indian tribes on the *Willow Beach Development Concept Plan* and other projects within Lake Mead NRA (e.g., the Hoover Dam Bypass Project, NPS 2001c), it is known that construction in areas affiliated with the Ha'tata and Salt Song Pathway would have adverse effects on ethnographic resources.

The preferred alternative represents an implementation of the *Willow Beach Development Concept Plan*. Tribal consultation for development of the plan indicated no concerns associated with the project area (NPS 1994a). Ground disturbing activities associated with the installation of septic tanks, pumps, and sewerlines in the developed area would, for the most part, occur in areas previously disturbed for construction of the existing wastewater treatment system. With continued consultation and mitigation (e.g., maintaining the fill covering, monitoring the excavation, and halting activities if human remains are inadvertently discovered), it is anticipated that impacts to ethnographic resources would be short and long

term, negligible, and adverse. Tribal consultation would continue during implementation of various components of the *Development Concept Plan*, including the wastewater treatment improvements of this preferred alternative. If ethnographic resource concerns are identified, consultation would continue to allow identification of appropriate mitigation measures.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions with the potential to affect ethnographic resources under the preferred alternative are the same as those described for the no-action alternative. See the no-action alternative discussion for details. The cumulative effect of the actions would have long-term, moderate, adverse impacts on ethnographic resources. The preferred alternative would contribute negligible contributions to these impacts in the short and long term, as a result of construction activities in areas affiliated with the Ha'tata and Salt Song Pathway. The overall cumulative effects of the past, present, and reasonably foreseeable future actions, in conjunction with the preferred alternative, would have long-term, moderate, adverse impacts on ethnographic resources.

Conclusion. It is anticipated that impacts to ethnographic resources would be short and long term, negligible, and adverse, as a result of construction activities in areas affiliated with the Ha'tata and Salt Song Pathway. The overall cumulative effects of the past, present, and reasonably foreseeable future actions, in conjunction with the preferred alternative, would have long-term, moderate, adverse impacts on ethnographic resources.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of ethnographic resources.

Section 106 Summary. Under alternative B, all work would be confined within previously disturbed areas and consultation with American Indian tribes would continue. After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5), the National Park Service proposes that implementing alternative B would result in a determination of *no adverse affect*.

Visitor Use and Experience

Under alternative B (the preferred alternative), the aging wastewater disposal and treatment system would be replaced with a new system that treats wastewater via septic tanks, a recirculating sand filter, and subsurface disposal. During construction, visitors could expect to see construction vehicle traffic on the road to Willow Beach, as well as within the Willow Beach developed area. Visitors would experience partial closure of walkways, roads, and parking areas while buried system components were being replaced within the developed area. Complete closure of Willow Beach visitor services or facilities should not be necessary, as the old treatment system would remain in operation until the new system is brought into service. To the extent possible, construction activities would be scheduled to avoid busy visitor periods such as weekends and holidays. Impacts of construction on visitor use and visitor experience would be minor, short term, and adverse.

Cumulative Impacts. The cumulative effects of past, present, and reasonably foreseeable future actions under the preferred alternative would be the same as those for visitor experience under the no-action alternative. See the no-action alternative discussion for details. The impacts of these cumulative effects would be short and long term, minor to moderate, and adverse, although some long-term beneficial effects could occur. The preferred alternative would provide minor contributions to these impacts in the short term by potentially causing traffic congestion and temporary closures of roads, walkways, and parking areas at Willow Beach, as well as adding visual intrusions and noise from construction equipment. The overall cumulative effects of the past, present, and reasonably foreseeable future actions, in conjunction with the preferred alternative, would have short-term, minor to moderate, adverse impacts on visitor use and experience.

Conclusion. Alternative B (the preferred alternative) would have minor, short-term, adverse impacts on visitor use and experience from construction activities. The cumulative effects of the other past, present, and reasonably foreseeable future actions, would have short- and long-term, minor to moderate, adverse impacts on visitor use and experience.

Health and Safety

Replacement of the leaking and deteriorating wastewater treatment system at Willow Beach would eliminate the potential to introduce sewage effluent into the infiltrated lake water that serves as a water source for the area. The recirculating sand filter and subsurface disposal systems would not produce odors that could affect visitors or National Park Service employees. In fact, the preferred alternative calls for improvements to odor controls on fish cleaning stations. Therefore, short- and long-term, beneficial effects to health and safety would be anticipated.

If construction were completed outside of the monsoon season, risks to worker safety from flash flooding would be reduced. However, if the project extends into July, August, and September, there is a greater risk of flash flooding. If work extends into those months, the construction contractor should implement a safety plan for working in desert washes. With a safety plan, the risk would have short-term (for the duration of the construction), negligible, adverse effects on worker safety related to desert washes and flash floods. The risks to Lake Mead NRA staff involved in operating and maintaining the wastewater treatment facility from flash flooding would be slightly reduced when compared to the no-action alternative, as the new system would likely require fewer operation and maintenance activities in Willow Beach Wash.

Cumulative Impacts. The cumulative impacts of the preferred alternative would be the same as those described for the no-action alternative. The cumulative impacts of these actions would have short- and long-term, negligible to minor, adverse impacts on health and safety. However, the preferred alternative, when viewed in the context of other regional impacts to water quality, as well as other construction projects at Lake Mead NRA, would contribute negligibly to the cumulative effects on health and safety in the short-term. Additionally, the beneficial effects realized under the preferred alternative do not contribute enough to offset the regional sources of water quality degradation, or the health and safety effects of other

construction activities at Lake Mead NRA. Therefore, the cumulative effects of these past, present, and reasonably foreseeable future actions, in conjunction with the preferred alternative, would have short-term, negligible to minor, adverse impacts on health and safety.

Conclusion. Short- and long-term, beneficial effects to health and safety would be anticipated from the replacement of the leaking and deteriorating wastewater treatment system at Willow Beach, as well as the reduction in odors associated with the system. Past, present, and reasonably foreseeable future actions, when considered in combination with the preferred alternative, would have short-term, negligible to minor, adverse impacts on health and safety.

ALTERNATIVE C

Biotic Communities

Under alternative C, replacement or repair of the leaking and deteriorating wastewater treatment system components at Willow Beach would reduce or eliminate the impacts to wildlife (e.g., fish, amphibians, and birds) associated with potential discharges of sewage effluent to Lake Mohave under the no-action alternative. This would have a short- and long-term, beneficial effect on biotic communities.

Work within the Willow Beach developed area to repair or replace manholes, repair a lift station, and replace valves would generally disturb currently paved surface areas that do not support vegetation and are of no habitat value to wildlife.

Approximately 7,500-linear feet of disturbance would occur from the installation of a new force main pipeline to the new sewage lagoon site, located approximately 4,000 feet up the wash from the existing site. Most disturbance would occur in previously undisturbed areas of Willow Beach Wash. Construction of four or five new sewage lagoons would also disturb approximately 130,680-square feet (3.0 acres) of previously undisturbed desert wash vegetation. Associated soil disturbance increases the potential for non-native species to invade the area of disturbance and alter the natural ecological community. Although mitigation measures would likely be implemented to offset some of this impact, the effects to desert wash vegetation are anticipated to be long term, minor to moderate, and adverse.

Causes of construction-related effects to wildlife would be the same as those described for the preferred alternative. However, as construction under alternative C would disturb a greater amount of desert wash habitat, the impacts are anticipated to be short-term (during construction), minor, and adverse.

Cumulative Impacts. Causes of cumulative impacts of alternative C would be the same as those described for the no-action alternative. See the discussion for the no-action alternative for details. Past, present, and reasonably foreseeable future actions within and outside of Lake Mead NRA, would have short- and long-term, minor, adverse impacts on biotic communities. Alternative C, when viewed in the context of other regional impacts, would provide short- and long-term minor to moderate contributions to the cumulative effects on biotic communities.

Additionally, the beneficial effects realized under this alternative do not contribute enough to offset the regional impacts to biotic communities. Therefore, the cumulative effects of past, present, and reasonably foreseeable future actions, in conjunction with alternative C, would have short- and long-term, minor to moderate, adverse impacts on biotic communities.

Conclusion. A short- and long-term, beneficial effect on biotic communities is anticipated from the replacement or repair of the leaking and deteriorating wastewater treatment system components at Willow Beach. The effects of construction related activities on desert wash vegetation and wildlife are anticipated to be long-term, minor to moderate, and adverse under alternative C. The cumulative effects of past, present, and reasonably foreseeable future actions, in conjunction with alternative C, would have short- and long-term, minor to moderate, adverse impacts on biotic communities.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of biotic communities.

Threatened and Endangered Species and Species of Concern

As discussed for "Biotic Communities" and "Floodplains and Water Quality," alternative C would eliminate existing impacts associated with potential discharges of sewage effluent to Lake Mohave. Eliminating this threat to infiltrated lake water and surface water quality at Willow Beach would have beneficial effects for the razorback sucker and bonytail chub, including the critical habitat in Lake Mohave for these species. Desert tortoises have not been sighted in the Willow Beach area since 1990, and although bald eagles could be transient in this area, no effects are expected to either of these species as a result of alternative C.

Cumulative Impacts. Cumulative impacts under alternative C would be the same as those described for the no-action alternative. See the discussion for the no-action alternative for details. Past, present, and reasonably foreseeable future actions related to urban development and visitor use at Lake Mead NRA would have short-term, negligible to minor, adverse impacts on the razorback sucker and bonytail chub, even when considering the beneficial effects of alternative C on these species. This beneficial effect contributes negligibly when viewed in the context of regional trends of habitat and water quality degradation that affects these species in Lake Mohave. There would be no impact to the desert tortoise and bald eagle under Alternative C, therefore there would be no cumulative impacts to desert tortoise and bald eagle.

Conclusion. Eliminating the threat of sewage effluent discharge to infiltrated lake water and surface water at Willow Beach would have beneficial effects for the razorback sucker and bonytail chub, including the critical habitat in Lake Mohave for these species. There would be no impact to the desert tortoise and bald eagle. Past, present, and reasonably foreseeable future actions would have short-term, negligible to minor, adverse impacts on the razorback sucker

and bonytail chub, even when considering the beneficial effects of alternative C on these species. There would be no cumulative impacts to desert tortoise and bald eagle.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of threatened and endangered species or species of concern.

Floodplains and Water Quality

Under alternative C, the new sewage lagoons would be bermed for flood protection. Upstream of the new lagoons, flows in Willow Beach Wash would be entirely diverted to a narrower portion of the channel using a diversion berm or dike constructed from excavated wash deposits and rock gabions. This would alter the morphology and processes of the floodplain in Willow Beach Wash, resulting in long-term, moderate, adverse impacts to this resource.

Replacement or repair of deteriorating wastewater treatment system components at Willow Beach would reduce or eliminate the impacts to surface and groundwater quality from potential discharges of sewage effluent. This would result in a long-term, beneficial effects on water quality in the Willow Beach area.

Erosion and sedimentation concerns described in detail for the preferred alternative would also occur under alternative C as a result of construction activities. See the preferred alternative discussion for details related to erosion and sedimentation. However, under this alternative, impacts to water quality could be greater, as a larger area of desert wash would be disturbed. Depending on the extent to which construction during periods of time associated with storm events could be avoided, increased erosion, sedimentation, and turbidity during construction could have short-term, minor to moderate, adverse impacts on water quality. Given the current potential for petrochemical spills from vehicles and boats in the Willow Beach area, the use of construction equipment could have short-term, negligible, adverse impacts on water quality.

Cumulative Impacts. Cumulative impacts of alternative C would be the same as those described for the no-action alternative. See the discussion for the no-action alternative for details. Past, present, and reasonably foreseeable future actions would have short- and long-term, minor, adverse impacts to floodplains and water quality. Alternative C would provide long-term, moderate, adverse contributions to the cumulative effects on floodplains and water quality by altering the morphology and processes of the floodplain. Additionally, the beneficial effects realized under this alternative do not contribute enough to offset the regional trend of floodplain alterations and water quality degradation. Therefore, the cumulative effects of past, present, and reasonably foreseeable future actions, in conjunction with alternative C, would have short- and long-term, minor to moderate, adverse impacts to floodplains and water quality.

Conclusion. The diversion of flood flows around the new sewage lagoons into a narrower portion of Willow Beach Wash would change the morphology and processes of the floodplain, resulting in long-term, moderate, adverse impacts to this resource. A long-term, beneficial effect on water quality in the Willow Beach area would result from replacement or repair of the leaking and deteriorating wastewater treatment system components. Depending on the extent to which storm events could be avoided, increased erosion, sedimentation, and turbidity during construction could have short-term, minor to moderate, adverse impacts on water quality. Given the current potential for petrochemical spills from vehicles and boats in the Willow Beach area, the use of construction equipment could have short-term, negligible, adverse impacts on water quality.

When considered with alternative C, past, present, and reasonably foreseeable future actions would have short- and long-term, minor to moderate, adverse impacts on floodplains and water quality. Additionally, the beneficial effects realized under this alternative do not contribute enough to offset the regional trend of floodplain alterations and water quality degradation.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of floodplains or water quality.

Soils

Work within the Willow Beach developed area to repair or replace manholes, repair a lift station, and replace valves would disturb paved surface areas. There would be no new ground disturbance in this developed area and, therefore, no impacts to soils from these elements of alternative C.

The installation of a new force main would cause disturbances along a 7,500-foot linear corridor, in previously undisturbed desert wash soils. Construction of four or five new sewage lagoons would require disturbance to 3 acres of previously undisturbed desert wash soils. Rehabilitation and revegetation efforts would likely be implemented to reduce scarring and loss of soil through erosion. Natural soil processes would be restored in rehabilitated areas only over the very long term, as soil structure slowly returned to a more natural condition. Some trampling and compaction of soils by construction equipment and workers within the construction zone would be expected. Local soil compaction would temporarily decrease permeability, alter soil moisture content, and diminish the water storage capacity of the generally xeric soils. Overall, impacts to soils from alternative C are expected to be long term, minor, and adverse.

Cumulative Impacts. Cumulative impacts of alternative C would be the same as those described for the no-action alternative. See the discussion for the no-action alternative for details. Past, present, and reasonably foreseeable actions, would result in long-term, minor to moderate, adverse impacts on soils. Alternative C would provide minor contributions to the

cumulative effects on soils. Therefore, the cumulative effects of past, present, and reasonably foreseeable future actions, in conjunction with alternative C, would have short- and long-term, minor to moderate, adverse impacts on soils.

Conclusion. Overall, the impacts to soils from alternative C are expected to be long term, minor, and adverse. Alternative C, when considered in combination with the effects of past, present, and reasonably foreseeable actions, would result in long-term, minor to moderate, adverse, cumulative effects on soils.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of soils.

Air Quality

Under alternative C, impacts to air quality would be the same as those described for the preferred alternative. See the preferred alternative discussion for details. Overall, impacts to air quality from dust and construction equipment emissions would be short term, negligible, and adverse.

Cumulative Impacts. The cumulative impacts of alternative C would be the same as those described for the no-action alternative. See the discussion of the no-action alternative for details. Past, present, and reasonably foreseeable future actions would result in short- and long-term, minor, adverse impacts to air quality. The intensity of these effects could vary depending on the number and timing (i.e., if they are simultaneous) of construction activities. Alternative C, when viewed in the context of other regional impacts, would contribute negligibly to the cumulative effects on air quality. Therefore, the cumulative effects of past, present, and reasonably foreseeable future actions, in conjunction with alternative C, would have short- and long-term, minor impacts on air quality.

Conclusion. Overall, impacts to air quality from dust and construction equipment emissions would be short term, negligible, and adverse. Alternative C, when considered in combination with the effects of past, present, and reasonably foreseeable future actions, would result in short- and long-term, minor, adverse, cumulative effects to air quality.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of air quality.

Ethnographic Resources

Under alternative C, impacts to ethnographic resources would be the same as those described for the preferred alternative. See the preferred alternative discussion for details. With consultation and mitigation (e.g., maintaining the fill covering, monitoring the excavation, and halting activities if human remains are inadvertently discovered), it is anticipated that impacts to ethnographic resources would be short and long term, negligible, and adverse. Tribal consultation would continue during implementation of alternative C. If ethnographic resource concerns are identified, consultation would continue to allow identification of appropriate mitigation measures.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions with the potential to affect ethnographic resources under alternative C are the same as those described for the no-action alternative. See the no-action alternative discussion for details. The cumulative effect of the actions would have long-term, moderate, adverse impacts on ethnographic resources. Alternative C would contribute negligibly to these impacts in the short and long term, as a result of construction activities in areas affiliated with the Ha'tata and Salt Song Pathway. The overall cumulative effects of the past, present, and reasonably foreseeable future actions, in conjunction with the preferred alternative, would have long-term, moderate, adverse impacts on ethnographic resources.

Conclusion. It is anticipated that impacts to ethnographic resources would be short and long term, negligible, and adverse, as a result of construction activities in areas affiliated with the Ha'tata and Salt Song Pathway. The overall cumulative effects of the past, present, and reasonably foreseeable future actions, in conjunction with the preferred alternative, would have long-term, moderate, adverse impacts on ethnographic resources.

Impairment of Park Resources and Values. Because there would be no major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the park's establishing legislation, (2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or (3) identified as a goal in the park's *General Management Plan* or other relevant National Park Service planning documents, there would be no impairment of ethnographic resources.

Section 106 Summary. Under alternative C, work would be confined within previously disturbed areas and consultation with American Indian tribes would continue. After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5), the National Park Service proposes that implementing alternative B would result in a determination of *no adverse affect*.

Visitor Use and Experience

Under alternative C, the existing sewage lagoon system would be replaced with a new lagoon system. New lagoons would be built about 4,000 feet up the wash from the existing lagoons, and new sewage lines, lift stations, and force main would be installed. During construction, visitors could expect to see construction vehicle traffic on the road to Willow Beach, as well as

within the Willow Beach developed area. Visitors would experience partial closure of walkways, roads, and parking areas while buried system components were being replaced within the developed area. Complete closure of Willow Beach visitor services or facilities should not be necessary, as the old wastewater treatment system would remain in operation until the new system was brought into service. To the extent possible, construction activities would be scheduled to avoid busy visitor periods such as weekends and holidays. Impacts of construction on visitor use and visitor experience would be minor, short term, and adverse.

Cumulative Impacts. Past, present, and reasonably foreseeable future actions with the potential to affect visitor use and experience under alternative C are the same as those described for the no-action alternative. These activities would have short- and long-term, minor to moderate impacts to visitor use and experience. Alternative C would provide minor contributions to these impacts in the short term by potentially causing traffic congestion and temporary closures of roads, walkways, and parking areas at Willow Beach, as well as adding visual intrusions and noise to the landscape (from construction equipment). The cumulative effects of alternative C, combined with other past, present, and reasonably foreseeable future actions, would have short-term, minor to moderate, adverse impacts on visitor use and experience.

Conclusion. Alternative C would have minor, short-term, adverse impacts on visitor use and experience from construction activities. The cumulative effects of alternative C, combined with other past, present, and reasonably foreseeable future actions, would have short- and long-term, minor to moderate, adverse impacts on visitor use and experience.

Health and Safety

Under alternative C, repair or replacement of the leaking and deteriorating wastewater treatment system components at Willow Beach would eliminate the adverse health effects described under the no-action alternative. Operation of the current lagoon system gives no indication that odors would be prevalent with the new system. There is no specific action identified that would reduce fish cleaning station odors under alternative C. Nonetheless, there would be short- and long-term, beneficial effects to health and safety from eliminating the potential for sewage leaks to contaminate water resources used by visitors and National Park Service employees.

Risks associated with construction, operation, and maintenance of a wastewater treatment facility in a flash flood area would be the same under alternative C as for the preferred alternative. The increased risk would have short-term (for the duration of construction and during operation, and maintenance activities), negligible, adverse effects on worker safety related to flash flooding.

Cumulative Impacts. The cumulative impacts of alternative C would be the same as those described for the no-action alternative. See the discussion for the no-action alternative for details. Cumulative impacts of these actions would have short- and long-term, negligible to minor, adverse impacts on health and safety. Alternative C would provide negligible contributions to the cumulative effects on health and safety. Additionally, the beneficial effects realized under alternative C do not contribute enough to offset the regional sources of water

quality degradation, or the health and safety effects of other construction activities at Lake Mead NRA. Therefore, the cumulative effects of past, present, and reasonably foreseeable future actions, in conjunction with alternative C, would have short- and long-term, negligible to minor, adverse impacts to health and safety.

Conclusion. Short- and long-term, beneficial effects to health and safety are anticipated from repair or replacement of the leaking and deteriorating wastewater treatment system components at Willow Beach. Overall, the cumulative impacts of these actions, when considered in combination with alternative C, would have short- and long-term, negligible to minor, adverse impacts on health and safety.

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LEGAL CITATIONS

- Act of August 25, 1916 (National Park Service Organic Act), PL 64-235, 16 USC § 1 *et seq.* as amended.
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- Clean Air Act, as amended, PL Chapter 360, 69 Stat. 322, 42 USC § 7401 *et seq.*
- Endangered Species Act of 1973, as amended, P.L. 93-205, 87 Stat. 884, 16 USC § 1531 *et seq.*
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- Executive Order 11990: Protection of Wetlands, 42 FR 26961, 3 CFR 121 (Supp 177).
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REFERENCES

CONSULTATION AND COORDINATION

A press release was issued in November 2002, requesting scoping comments related to the Willow Beach wastewater treatment system improvements. No comments were received.

Agencies and organizations contacted for information, assisted in identifying issues, or that will be given an opportunity to review and comment on this environmental assessment include:

FEDERAL AGENCIES

Bureau of Indian Affairs
Bureau of Land Management: Nevada and Arizona
Bureau of Reclamation
Environmental Protection Agency
Federal Highway Administration
Natural Resources Conservation Service
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
U.S. Forest Service

STATE AND LOCAL INDIVIDUALS AND AGENCIES OF ARIZONA

Honorable Janet Napolitano, Governor
Honorable John Kyl, United States Senator
Honorable John McCain, United States Senator
Honorable Jeff Flake, United States Representative
Honorable Trent Franks, United States Representative
Honorable J.D. Hayworth, United States Representative
Honorable Jim Kolbe, United States Representative
Honorable Ed Pastor, United States Representative
Honorable John Shadegg, United States Representative / Arizona Game and Fish Department
Arizona Department of Environmental Quality / Arizona Department of Water Resources
City of Bullhead City
City of Kingman
Mohave County
State Historic Preservation Office

LIBRARIES

Boulder City, Nevada
Clark County Community College
Clark County, Nevada
Las Vegas, Nevada
Mesquite, Nevada

University of Arizona, Tucson
University of Nevada, Las Vegas

AMERICAN INDIAN TRIBES

Ak-Chin Indian Community
Chemehuevi Band of the Southern Paiute
Colorado River Indian Tribes
Fort Mojave Tribe
Fort Yuma Quechan
Gila River Indian Community
Havasupai
Hopi Tribe
Hualapai
Kaibab Paiute
Las Vegas Band of the Southern Paiute
Moapa Band of the Southern Paiute
Mohave
Navajo Nation
Pahrump Band of the Southern Paiute
Paiute Indian Tribes of Utah
Salt River Pima – Maricopa Indian Community
Shivwits Band of Paiutes
Yavapai
Zuni

OTHER GROUPS AND INDIVIDUALS

Audubon Society
Citizen Alert
Defenders of Wildlife
Desert Tortoise Council
Desert Research Institute
Earth First!
East Las Vegas Citizen's Advisory Council
Environmental Defense Fund
Environmental Forum
Fraternity of the Desert Bighorn
Grand Canyon Trust
Lake Mead Concessioners
Las Vegas Jeep Club
Mule Deer Foundation
The Nature Conservancy
Sierra Club
Mr. Dale A. Stirling
The Wilderness Society
The Wildlife Society

PREPARERS

This environmental assessment was prepared by engineering-environmental Management, Inc., under the direction of Mr. William Dickinson, Superintendent, Lake Mead NRA. Mr. Dickinson and Lake Mead NRA staff, especially Mike Boyles, Steve Daron, Nancy Hendricks, Rosie Pepito, Steve Spearman, and Chanteil Walter, provided invaluable assistance in the development and technical review of this environmental assessment. The individuals who prepared this document are listed below:

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APPENDIX A

NATIONAL PARK SERVICE PRESS RELEASE



National Park Service
U.S. Department of the Interior

Lake Mead
National Recreation Area

601 Nevada Highway
Boulder City, NV 89005
702 293-8907
702 293-8936

Lake Mead NRA News Release

November 6, 2002
For Immediate Release
Karla Norris, 702-293-8947
Karla_Norris@NPS.gov

Public Input Solicited for Projects at Lake Mead National Recreation Area

Superintendent William K. Dickinson announced today that the National Park Service is currently soliciting input for several projects proposed at Lake Mead National Recreation Area. Public input is sought to develop feasible alternatives and formulate issues related to the following projects:

The rehabilitation of the Northshore Road, from mile marker 20.8 to 30.3
Improvements to the Willow Beach, Arizona, waste water treatment facility
Reconstruction of a picnic area at South Cove, Arizona
Rehabilitation of the Roger's Spring picnic facility
Extension of the River Mountain Loop Trail within the boundaries of the recreation area
Placement of wayside exhibits along existing roadways in the recreation area
Realignment of South Telephone Cove Road, Arizona.

The National Park Service will be analyzing these proposals in accordance with the National Environmental Policy Act (NEPA) of 1969. The projects will each be evaluated in separate environmental documents.

Written comments on the projects should be received by December 6, 2002. To submit written comments, or to be included on the project mailing list, please write to: Superintendent, Lake Mead National Recreation Area, Attention: Environmental Compliance Specialist, 601 Nevada Way, Boulder City, Nevada 89005.

For further information on any of the listed projects, please contact Environmental Compliance Specialist Nancy Hendricks at (702) 293-8756.

Lake Mead National Recreation Area is a unit of the National Park Service.

-NPS-

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EXPERIENCE YOUR AMERICA

The National Park Service cares for special places saved by the American people so that all may experience our heritage.

APPENDIX B

U.S. FISH AND WILDLIFE SERVICE LISTING OF THREATENED AND ENDANGERED SPECIES

Appendix B

U.S. Fish and Wildlife Service Listing of Threatened and Endangered Species

(accessed from <http://ifw2es.fws.gov/EndangeredSpecies/lists/ListSpecies.cfm> on January 8, 2003)

Mohave County

Common Name	Scientific Name	Listing Status	More Info
Arizona cliff-rose	<i>Purshia subintegra</i>	E	P
bald eagle	<i>Haliaeetus leucocephalus</i>	AD, T	P
bonytail chub	<i>Gila elegans</i>	E	P
brown pelican	<i>Pelecanus occidentalis</i>	DM, E	P
California condor	<i>Gymnogyps californianus</i>	E, EXPN	P
desert tortoise	<i>Gopherus agassizii</i>	SAT, T	P
Fickeisen plains cactus	<i>Pediocactus peeblesianus fickeiseniae</i>	C	P
Holmgren milk-vetch	<i>Astragalus holmgreniorum</i>	E	P
Hualapai Mexican vole	<i>Microtus mexicanus hualpaiensis</i>	E	P
humpback chub	<i>Gila cypha</i>	E	P
Jones cycladenia	<i>Cycladenia humilis</i> var. <i>jonesii</i>	T	P
Mexican spotted owl	<i>Strix occidentalis lucida</i>	T	P
razorback sucker	<i>Xyrauchen texanus</i>	E	P
Siler pincushion cactus	<i>Pediocactus (=Echinocactus, =Utahia) sileri</i>	T	P
southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	E	P
Virgin River chub	<i>Gila robusta seminuda</i>	E	P
western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	C	P
woundfin	<i>Plagopterus argentissimus</i>	E, EXPN	P
Yuma clapper rail	<i>Rallus longirostris yumanensis</i>	E	P

E – Endangered

T – Threatened

EmE – Emergency Listing, Endangered

EmT – Emergency Listing Threatened

EXPE, XE – Experimental Population, Essential

EXPN, XN – Experimental Population, Non-Essential

SAE, E(S/A) – Similarity of Appearance to an Endangered Taxon

SAT, T(S/A) – Similarity of Appearance to a Threatened Taxon

PE – Proposed Endangered

PT – Proposed Threatened

PEXPE, PXE – Proposed Experimental Population, Essential

PEXPN, PXN – Proposed Experimental Population, Non-Essential

PSAE, PE(S/A) – Proposed Similarity of Appearance to an Endangered Taxon

PSAT, PT(S/A) – Proposed Similarity of Appearance to a Threatened Taxon

C – Candidate Taxon, Ready for Proposal

D3A – Delisted Taxon, Evidently Extinct

D3B – Delisted Taxon, Invalid Name in Current Scientific Opinion

D3C – Delisted Taxon, Recovered

DA – Delisted Taxon, Amendment of the Act

DM – Delisted Taxon, Recovered, Being Monitored First Five Years

DO – Delisted Taxon, Original Commercial Data Erroneous

DP – Delisted Taxon, Discovered Previously Unknown Additional Populations and/or Habitat

DR – Delisted Taxon, Taxonomic Revision (Improved Understanding)

AD – Proposed Delisting

APPENDIX B: U.S. FISH AND WILDLIFE SERVICE LISTING OF THREATENED AND ENDANGERED SPECIES

AE – Proposed Reclassification to Endangered

AT – Proposed Reclassification to Threatened

APPENDIX C

STATE HISTORIC PRESERVATION OFFICE CONSULTATION LETTER

SHPO- 2003 - 1362 (16235)

United States Department of the Interior



NATIONAL PARK SERVICE

LAKE MEAD NATIONAL RECREATION AREA
601 NEVADA HIGHWAY
BOULDER CITY, NEVADA 89005

AK/SC
JUN 17 2003
6/18/03

IN REPLY REFER TO:

H4217 (LAME-RM)

June 11, 2003

Mr. James Garrison
Arizona State Historic Preservation Office
Arizona State Parks
1300 West Washington
Phoenix, Arizona 85007

Dear Mr. Garrison:

The National Park Service seeks your concurrence with the following recommendation. The cultural resources staff at Lake Mead National Recreation Area recommends site AZ F:2:99 (ASM), a demolished mobile home and trash scatter, as not eligible for the National Register of Historic Places. The recommendation was made after a survey of the site in association with the project "Waste Water Treatment Facility Upgrade, Willow Beach, Lake Mead National Recreation Area (NRA), Mohave County, Arizona" (LAME CRP # 02-028, WACC Project # LAME 2002-K, Clearance # 008-2003-LAME).

Documentation for the project and site AZ F:2:99 (ASM) are enclosed. Because the site is recommended as not eligible for the National Register of Historic Places, the project "Waste Water Treatment Facility Upgrade, Willow Beach, Lake Mead National Recreation Area (NRA), Mohave County, Arizona" will have no effect on any National Register eligible properties. The Lake Mead cultural resources staff recommends the project proceed with the following condition: if concealed archeological resources are encountered during project activities, all necessary steps will be taken to protect the resources and the park archeologist and/or cultural resource specialist will be notified immediately.

Should you have any questions, please contact Park Archeologist Steve Daron at (702) 293-8019.

Sincerely,

William Dickinson
for William Dickinson
Superintendent

Enclosures

CONCUR

William Dickinson 7/3/03
ARIZONA STATE HISTORIC PRESERVATION OFFICER
ARIZONA STATE PARKS BOARD